
AN
ABRIDGMENT
OF
TOME II.



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P R E F A C E.



NOTHING offends discreet Persons more than to find in Chymical Authors Processes without Order or Design; the Professors themselves have hitherto shew'd nothing but Processes promiscuously, as the Professor thought fit; but as soon as Pupils above thirty Years ago were willing I should teach them Chymistry, I began to think seriously whether they could not be put into a better Order, so that, according to Hippocrates, nothing might be done rashly, nothing be omitted.

Therefore that nothing might be done in vain, I make one Operation serve for many; I shew how to prepare Bawm Water, the same Process will serve for Marjoram, Rosemary and Rue: I want, for example, a Citron-water distill'd from Wine, the same Process will serve all other aromatick

matick Spirits, and so I avoid a nauseous Repetition.

And I have always shew'd whatever ought to precede, before I proceed to what ought to follow ; and thus I observe the Order of the Mathematicians, and take notice of every thing that is singular, and thus I improve this Art so useful to learn the Powers of Medicines. In this I have not always an Eye to Physick, but also to Natural Philosophy, for which it is very useful; and as the Processes are employ'd on Vegetables, Animals and Fossils, I shall first treat of Vegetables, and I shall take all for granted which I've spoke of Vegetables in the first Part.

*By Operations I mean the Changes that are introduc'd in Bodies, to which four Conditions are requir'd ; first, That it be very easy ; secondly, That it be simple, and done with the least Trouble ; thirdly, The first Operation must not introduce any great Change on the Body ; fourthly, It only must be a Separation, but no Change of the Parts must be introduc'd : From this we shall have a fourfold Advantage ; first, We shall know what Parts are really in Bodies, naturally ; for when we torture Bodies, we must not conceive those Parts * pre-existent that appear ; secondly, The Artist will be sure that what remains behind is not changed ; thirdly, It will be in his Power to know*

* Then we create, or at least alter and don't separate Parts.

what did remain behind, and to examine it; fourthly and lastly, He will exactly know what has been us'd in this Experiment, and what Force has been us'd: I could wish this Work had been done to my Hand.

There are some Conditions requir'd to perform this first Operation; first, That what is separated be most simple; secondly, That it be such a Body from whence others are made; thirdly, That it be easily separable, and thus the natural Order of Things will be observ'd.

The Instrument also, by which this is done, requires some Conditions; first, That it be very simple, lest it spoil the Material; secondly, That being applied, it may serve to be employ'd in all the Operations that are to follow; thirdly, That it don't change the Body further than this first Operation; fourthly, That it don't change the Order of its Particles, otherwise other Parts would be mix'd. When these Conditions are observ'd, the Artist will know what concurs to constitute the Nature of the Body to be examin'd; to all this a gentle Fire contributes.

Vegetables are compounded of Fluids and Solids; there are in Vegetables absorbing Vessels, which are particularly in the Root. These admit of Air and Fluids; as they admit of Air, they serve as a Larynx; these are evident in the Stalks of Dandelion.

lion. Some other Vessels serve for Motion, and they propel the Fluids receiv'd: There are also Vessels which change the Fluids into new Forms, and give 'em the Nature of the Plant. Fourthly, There are peculiar Ducts, that receive peculiar Juices; thus it is in Aloes; thus in Celandine, where a golden colour'd Juice is separated; thus in Tithimal, whose Juice is milky. Fifthly, There are peculiar Receptacles, where the Juices remain long at rest, and these contain the Oil. Sixthly, There are secretory Canals, from whence watry Gums and such Things issue. The Liquors in these Vessels differ infinitely; in the Acetabula of the Leaves of the Flowers of Aloes I find a Liquor like Honey, whereas elsewhere 'tis altogether bitter; hence how great a Difference must there be in these Juices, when we treat 'em chymically? next, as the Juices are so various, what they afford chymically must also be such; for example, the Pulp of Cassia affords one Liquor, the Bark another; the Pith of a Sugar-cane affords Sugar, the rest acid, &c. Thirdly, We must observe the different Colours; thus Poppy, or Esula, being wounded, a Milk issues forth, but Beet gives a red one. Fourthly, You must observe the Smells which are peculiar in each Liquor; in Jessamin the Flowers only are fragrant &c. Fifthly, We must observe the various Tastes, and as each Plant has its peculiar Smell

*Smell, so each has its peculiar Taste. Sixthly, We must observe Seasons which give great variety to Plants. Seventhly, We must observe that all Plants have some Salts in them, and the Water being evaporated in Summer, they then abound more in Salt, Spirit and Oil. Eighthly, Artists very rarely get the pure parts from the Plant, which Nature had bestow'd on it, but they change it by their Operations sometimes into very contrary Parts. So Helmont acknowledges. However, O ye best of Hearers, 'tis certain that Chymistry produces somewhat new, which was not in * nature, and those products must have new Virtues.*

Behold, most noble Hearers, by virtue of my Office I have forewarn'd you of several things, pardon me if I have been tedious, or shall be so by my Harangues, every thing in nature being well done, without Mistakes, will be full of somewhat new; he who errs, the further he proceeds, the more harm he does. I will first shew you what is to be done with the Body, so as not to change it: I will then exactly describe to you the Operation itself. Thirdly, I will propose the effects this Operation has had upon the Body. Fourthly, I will expose these Bodies, thus treated, to your view. Fifthly, I will shew you the Instruments by which 'tis done. Sixthly, I will subjoin some corollaries that follow. Seventhly, I will shew you their

* A grand Mistake.

Virtues, in which affair I will be ingenuous without boasting; I will also point out to you the Indolence of some, and the Falsity of others: In which affair I will be of use, having by the long experience of the third part of an Age learnt the truth of things, I will not deceive any.

I will begin with recent Plants gather'd in the Summer, I will try all the Operations upon this Plant that I can; for example, I will first get the Water from Rosemary, then the Salts, Oils, and what else it will afford, whereas were the Water got from one, Salt from another, and Oil from a third, we should never understand the Analysis nor the true Operation of a Plant: These things were previously necessary to be known before we begun the Operations, now let us proceed prosperously.





THE
FIRST PART
OF THE
Chymical Operations
ON
VEGETABLES.

PROCESS I.

*The distill'd water of Rosemary exhaling in the form
of vapour, by a heat equal to that in summer.*

The PREPARATION.



TAKE full grown fresh Rosemary, with the morning dew on it, whole, not cut or bruis'd; put it upon the round plate into the furnace. *Plate 17. Fig. 2.* pil'd up three inches high, without squeezing it, then cover it with a tin alembick, and fit a recipient to the beak; make a charcoal fire of 85° (measur'd by *Fahrenheit's* thermometer) keep up this heat

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heat, till you have got enough of the water; keep the liquor in a glass bottle, close shut, for some days, in a cool place, unmov'd, 'tis odoriferous.

The nature and use of this water.

In this liquor are contain'd, 1. the dew, moisten'd with exhaling parts of the plant; 2. the watry juice of the plant, as appears by leaving the vessel, that holds it, open, for the evaporation of the odoriferous parts; 3. the seeds, or the mother, which mucilage grew more and more, after having kept the water a year, and made the water muddy. In this water then there is water and the *Spiritus Rector*, which gives the peculiar smell and taste to each plant, and this is the part that exhales, leaving the water behind.

The virtue resides in this volatile part, which, by its moveable acrimony, excites the spirits, and moves the nerves; hence do they relieve faintings by their fragrancy, so long as they retain it, which soon flies off.

It is to be observ'd, that this *Spiritus Rector* differing in each plant, we must not wonder if we meet with each aromattick plant or any other differing from another in virtue, altho' of the same class; so Lavender and Bawn are highly enlivening and throw off any torpor of the nerves; so *Indian Hyacinth*, tho' fragrant, excites spasms in hysteric and hypochondriack persons, and Rue cures these spasms, let therefore chymists be wary in pronouncing dogmatically on these waters; Rue then and Bawn are known to revive the spirits.

Hence is known what it is that exhales from vegetables in summer, and the juice that drops upon cutting trees is of this sort: *Hales*. Hence the advantage by living in proper places, as well

as the disadvantage; thus in *America* were people rendered sickly; thus living under the shade of the Walnut or Yew-tree renders persons sleepy.

A list of such follows: Southernwood, Mother-wort, Garlick, Dill, Angelica, Aniseeds, Orange, Calamint, Cardamoms, Catmint, Cloves, Gilliflowers, Aromaticks, Cassia, Sallary, Onions, Chervil, Camomil, Cinnamon, Citron, Scurvy-grass, Coriander, Saffron, Cummin, Dittander, Fennil, Galingal, Clary, Hyssop, Jasamin, Lavender, Bay, Lovage, Lilly of the Valley and the white, Lemon, Mace, and all other bitter Aromatick and Foetid plants or trees; all these contain a volatile and aromatick matter, which is got by this first preparation; and sometimes there is a peculiar virtue in the root, as Cinnamon affords Camphire, sometimes in the woods as in Rhodium, sometimes in the bark as in Cinnamon, sometimes in the catkins as Walnuts, often in the flowers, leaves and seeds; therefore, O my hearers, how many things do you learn from this first preparation?

P R O C E S S II.

An Infusion and a Decoction from the remainder of the first Process:

We will now examine what the fire and water does by the heat from 45° to 85° , and so gently to 212° , or till the ebullition.

The P R E P A R A T I O N.

First, Take the Rosemary that remain'd from the last operation, 'tis now dry and without smell, and crumbles with your fingers and has another taste; let it dry well in the open air. *Secondly*,
Pour

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Pour pure rain water upon it warm'd from 85° , even to 211° ; let them infuse and continue in this heat, the vessel being shut for half an hour or more, pour out this liquor, 'tis an infusion of Rosemary, without much smell and robb'd of the taste; pour the water of the first process on to this infusion, and you have the virtue of the plant, and perhaps (a) this is the best way of getting the virtue, unless you prefer the express'd juices. *Thirdly*, Or boil the plant, with the plant left after the first process, and then 'tis call'd a decoction or apozem; which if you put into an alembick, fit to it a recipient; the water distills and leaves a decoction behind, or if you boil the whole plant in *Papin's* digester, it has the whole virtue of the plant, but differs in some small matter in its effects. *Fourthly*, To the remainder, after the first decoction, put on fresh boiling water, and boil, take off the scum, 'tis oily and burns, pour on and thus pour off water in this manner for twenty times together, till the water affords neither taste, colour nor smell, avoiding smoak, &c. then the leaves are as big as at first, become brown and sink to the bottom. *Fifthly*, When the plant is resinous as in Guaiacum, we must either macerate or put in Salt of Tartar, or this oleous part will not be communicated. *Sixthly*, Such resinous vegetables, when fresh, communicate their oil to water, but not when dry; so with Guaiacum they cure the pox in *America*.

As therefore boiling water, where a heat of 212 degrees is requir'd, makes somewhat volatile fly off, such plants are not fit for decoction; hence those that are more fixt, such as acids, astringents, viscous aromatics, demulcents, emollients, coolers, nutrients, saponaceous, and viscous ones,

(a) Pray wou'd not infusion upon the fresh plant answer our ends with less labour?

that

that are not resins, are fit for decoction, such as Wormwood, Acacia, Sorrel, Water-creffes, and the like are fit for this purpose; hence also the juices of fruits expressed but not fermented; mean while I don't say that the *Spiritus Rector* will be communicated, or however it may not affect our senses as in the roots of black *Hellebor*, *Cicuta Aquatica*, and *Solanum Maniacum*.

The nature, virtues, and use of these decoctions and infusions.

First, Vegetables being so prepar'd, will pass all the vessels and mix with the humors. *Secondly*, And act with their whole force, by the impulse of the Blood. *Thirdly*, They have not the same efficacy with the water of the first process, yet this loss is repair'd by the fire; particularly if the water be pour'd upon the decoction. *Fourthly*, The virtue also depends upon the warm water; hence they who drink Tea hot, may as well impute the damages they receive, to the hot water as to the Tea. *Fifthly*, Hence we see the manner of preparing infusions and decoctions, then we find the force of boiling water upon the solids, nothing of which is destroy'd thereby, tho' they were the tenderest flowers, as I've found by the microscope. Hearken, ye physicians, and see how boiling water does not dissolve our vessels, they are rather broke by the impulse, than with the heat or moisture, therefore our vessels are terrestrial parts join'd with the glue. (b) *Sixthly*, Dry these leaves, they grow less, moisten them with warm water, they grow large again. *Seventhly*, Some plants lose their force by

(b) Pray what becomes of our vessels when we are scalded by water? does it not flea us both in the mouth, stomach, and the hardest parts of our skin, and raise inflammations?

boiling,

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boiling, as Arum and Alarum, the latter of which being infus'd, is vomitive, but boil'd, is diuretick.

P R O C E S S I I I.

The extract call'd the Sapa, Defrutum, Rob or Jelly, made from what remains of the second Process.

The P R E P A R A T I O N.

Now we consider what is produc'd upon calling off the water. *First*, Let the infusion or decoction settle, then strain it; some make use of the white of an egg, which they boil along with this decoction, and so let it settle. *Secondly*, Exhale the liquor so depurated, till it grows of the consistence of honey; it must not be strongly boil'd nor burnt. Thus is prepar'd Liquorish juice, and the rob of berries; we may call this must, and this being boil'd to half, is call'd Sapa; to one third only, Defrutum, *a defervendo*; when 'tis boil'd so as a drop will congeal, 'tis call'd Jelly; and if to the thickness resembling honey, but thinner, a Syrup; if yet thicker, a (c) Rob or Robob; but extract is a general name for all.

The nature, virtues and use of all these.

The dissolution therefore in warm water is a decoction. These may be kept long; they preserve their taste, but lose their smell; they have the virtue of the whole plant, as to its first parts; if the plants from whence they are made are putrify'd, they communicate no virtue. These things are fit to carry to sea, such as marmalade of Barburies, Currants, &c. However, where there is

(c) From 217, *succus condensatus*.

any salt in 'em, they will melt in the fire; as the marmalade of Lemons, therefore they must be kept close cover'd.

PROCESS IV.

The calcination of what remains of the vegetable after the second Process.

Now let us examine what the open fire will do to these plants. *First*, We lay it upon a clear fire upon an iron spoon till it grows white, it smoaks, grows black, and flames; we keep it there till the ashes grow white and may be blown away. *Secondly*, I put these ashes into a clear glass, pour on rain water, let 'em stand, then strain it, then exhale the water, and the water tastes saline, and leaves an earth behind, which will make, along with water, vessels to melt metals.

The use of this Process.

This water takes off all saline parts, whether fixt or volatile, but boiling does not take off the oily parts, which fly off in smook and flame, and which make the black ashes. *First*, This last oil does not disappear unless you calcine in the open air: 'Tis this oil that maintains the cohesion between the parts, which being exhaled they lose; hence there's a threefold sort of oil, a froth, a fatty substance in decoctions, and this agglutinating oil, which is only separable by an open fire; that part that subsides is an unchangeable earth; these ashes make cupels for those who deal in metal: If water be added to these ashes they grow tenacious, and with oil more so. The medicated virtues reside in the decoctions; the more dry the plant becomes, the virtue lessens; hence it is that
the

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the virtues of plants are not destroyed by the heat of the sun so long as fresh is supplied: The most boiling water does not destroy the flowers, not being capable of separating this oil of the earth; salt therefore is no part of the solids, and air by the admission of the fire only separates this oil, which the fire alone could not do. (d)

PROCESS V.

The Preparation burnt after the third Process gives Salt Ashes.

Let us now see what it will do upon infusions, decoctions and extracts in the third Process.

PREPARATION.

Let the extracts be dry'd in a spoon upon a fire that is clear; they will grow black and viscous, and by degrees grow white, tasting burnt and bitter, and at last turn from black into yellowish ashes; then being kept long upon the fire, they grow white and taste saltish: Dissolve these in fair water, strain 'em, inspissate 'em, they give a brownish white, fiery and lixivial salt, which differs according to the nature of the plant and the violence of the fire.

The Use.

First then, Boiling water dissolves the oil and salt of the plant. *Secondly*, This oil and salt is the soap of the plant. *Thirdly*, The fire robs the salt of this oil. *Fourthly*, This oil gave the colour to the extract. *Fifthly*, If the water of the

(d) When we distill and burn a plant, the cover helps to cohobate the oil, that always falls back upon the earth, which keeps it black.

first

first process, the infusion of the second, and this salt be mixt, they prove an efficacious remedy. *Sixthly*, Fetid and aromatick plants scarce afford any.

PROCESS VI.

The fresh plant, or what remains after the first Process, affords salt ashes.

PREPARATION.

Place the Rosemary in an iron spoon upon a clear fire, the volatile parts exhale and leave a blackness, it begins to smok and at last to flame, so that the black oil flies off and then all grows white. *Secondly*, These ashes retain the natural figure of the plant till they come to be white, which then is destroyed. These ashes taste fiery and hot, and being diluted with water, strain'd and evaporated, they give a fixt salt.

Their Use.

First, Water dissolves the juice of the plant and leaves the solid safe. *Secondly*, Fire does not more, for it leaves salt. *Thirdly*, The water draws off the combustible part. *Fourthly*, The saline parts are not made volatile, but the oils fly off. *Fifthly*, The oil and salt are separated by the fire. *Sixthly*, Whilst the salt and the oil continue connected we are in health, but unhealthful if they separate in the vessels, therefore the diversity of plants is in their juices.

P R O C E S S VII.

The natural Salt of plants prepar'd from their juice newly express'd.

The former preparations have shewed us what the water, air, and fire, will do in plants; now we must enquire into the natural salt of plants, but as it requires some months to prepare this salt, I will shew you the beginning and the end of the preparation, and supply the rest by explaining it: We must not suppose that this salt is in the plant because 'tis drawn out by the fire.

P R E P A R A T I O N.

First, Take Sorrel before it flowers, in a morning, wash it, cut it and bruise it, and express its thick juice. *Secondly*, Put to it six parts of water, and dilute it so as it may strain. *Thirdly*, Put this into a *Manica Hippocratis* of linen, so that it run through; strain this often over again. *Fourthly*, Boil this liquor till it comes to be of the consistence of cream. *Fifthly*, Then put it into a broad glass urinal, pour oil upon it, put it into a cellar let it stand for eight months, and you will have tartar, the liquor swimming above. *Sixthly*, Take out this salt, wash it clean with cold water, dry it, you have the natural or essential salt, differing much from the fixt. *Seventhly*, If you try this in other plants, you'll have very different salts, some nitrous, some tartarous, &c. Where any oil parts abound, as in Purcelan, &c. they must be first fermented before they afford this salt; hence abounding oils hinder this concretion.

The Use.

'Tis soluble in water, 'tis compounded of oil and salt, which is not alkaline; 'tis miscible with

the blood, and will burn in the fire and make a fixt salt.

PROCESS VIII.

The native Salt of plants produced after fermentation, call'd the Stone or Tartar of wine.

PREPARATION.

The juices of fruits being press'd and fermented are call'd wine; the dregs settling are call'd the mother of the wine: This wine being drawn off from the lees, into another cask, by degrees the *Tartar* is thrown quite round the hoghead, not to the bottom only; and if you draw off the wine again into another cask, you get more of this tartar or winestone; sweet wines afford little, Rhenish the most: This stone is red or white, as the wine is.

Its Use.

This is another natural salt, acid-oleous, calcifiable into salt of Tartar: It neither dissolves in vinegar, wine, nor cold water, but in boiling water, and it settles again as soon as it cools, unless in 20 times its weight of water. In calcining it breeds air: It is good in bilious cases and acute ones; it purges gently; with an acrid and putrid matter, it is soluble, see process 54, 55. when by Analysis it will appear to contain air, water, and spirit, a volatile, and thick oil and earth.

PROCESS IX.

The Salt from the fresh Rosemary calcin'd after Tachenius's manner.

PREPARATION.

1. Place the dry Rosemary upon a frying-pan, cover it, make a fire under it, which gradually encrease,

crease, it turns into a black coal, add more, burn it also, till you have burnt what you want; the cover hinders the flaming, which it shou'd; this is calcination, and the black coal left is bitter when put into water.

2. Take off your cover and burn it white, by stirring it about; the oil flying off makes it white by the air and fire, 'tis then saltish and a true fixt salt.

3. Leave it still on the fire, stirring it, it has lost its water and oils, but has earth; 'tis saponaceous.

4. Put this powder into any vessel, pour six or more parts of boiling water to one of ashes, stir them, the earth settles, and the water contains the fiery salt; strain, leaving the earth behind.

5. Exhale the water, and the salt is at bottom, which runs in the air; the browner, *i. e.* more oily, the better.

6. Put this salt into a crucible till it melt, then pour it out, 'tis *Tachenius's* salt; any plant affords the same, and has the same virtues.

Its Use.

These salts are compound salts, *i. e.* of oil and salt; they are not so contrary to acids as pure alkali's; they may be us'd as sea-salt; they run if expos'd to the air; they mix with all our humours, and even our oils; hence they pass all, *but the Nerves*; they dissolve coagulations, if we also make use of exercise at the same time; they do not dissolve the stone nor cure the gout: However, they stimulate the nerves, and help languors, hypochondriacks, hysticks, and diseases from sluggishness of the blood; they open obstructions of the vessels; promote secretions by their stimulus, and therefore promote sweats and urine, as well as stools, as costive hypochondriacks do experience.

rience. They dissolve tenacious humours in the liver and elsewhere, wherefore they are good in chronical cases, in grossness of the blood, and relax'd fibres: But in putrid, bilious, alkaline, and feverish bloods, they are dangerous.

Their dose is from 4 gr. to 3ij, upon an empty stomach; they must be diluted in 72 parts of water; if you design to help costiveness by them, give 9 gr. of Succotrine Aloes, or half a dram of *Pil. Ruffi*, and in the morning take a requisite dose of this salt in water: If you design 'em for a diuretick, omit the Aloes in the evening, and drink Tea or Coffee after the draught; if for a diaphoretick, drink it in the morning in bed, and upon it drink Sassafras Tea, common Tea or Coffee, and cover yourself close up. If you are for curing agues by 'em, purge twice or thrice, then four hours before the fit give a dose of these salts; the *Spaw* waters do only exceed these salts in their virtue.

PROCESS X.

Salt of Carduus Benedictus after Tachenius's manner.

PREPARATION.

This is done as in the ninth Process, and therefore 'tis needless to repeat it.

Its Use.

There is oil and salt in it; and as any plant affords the same, 'tis no matter which you calcine: Bean-stalks then are as good as any, they are cheapest and as good in their virtues, altho' *Paracelsus* commends the salt of these against the stone; only take care they are not rotten, as we must always observe.

PROCESS XI.

*The common Salt got from the fresh Plant calcin'd,
as prepar'd by the Apothecaries.*

PREPARATION.

Take any fresh herbs, as Wormwood, Carduus, Fern, Kali, Bean-stalks, or the like, dry them, shake them to clear them of their sand, pile them up on the clean brick floor, set fire to them till all turns into white ashes, sift them. *First*, They smok, which grows black, till they flame, which at first is blackish about; then the flame is like that of lightning; the smok continues whilst any blackness is in the plant: *Lastly*, All the flame vanishes and the ashes sparkle; the oil makes flame and smok. The Salt made, as before, is more alkaline and fiery.

Their Use.

These Salts, according to the strength of the fire, are stronger or weaker; they are all alike.

PROCESS XII.

The fix'd, alkaline, acrimonious, fiery Salt of vegetables, and their Oil per deliquium.

PREPARATION.

1. Do as in the ninth and tenth Process.
2. Or do as in the eleventh Process.
3. Burn them till they grow white without flowing, for then you get glass and no salt; hence commentators tell us the earth will turn into glass at the general conflagration.
4. Boil these ashes with four times as much rain water, let them stand to cool and settle clear

clear; boil the remainder over and over again afresh, till you have all the falt; then boil the whole clear'd to the confiftence of honey, then ftir till all is dry, taking care it boil not over.

5. Then put it into a crucible and calcine it, then put it into a mortar warm'd, and powder it, from thence into a warm glafs bottle, ftop it well and foon with cork pitch'd.

6. The longer this falt is calcin'd, 'tis the more fiery, alkaline, and ftong, and 'tis of various colours as 'tis calcin'd, white, blue, green, brown, red; take care coals don't fall into it to change this colour.

7. Juices, extrafts, effential falts, will by calcining turn into fixt falts.

8. Some afford falts fooner than others, as Vine-twigs, and this is *Valentine's* Antipodagrick and Lithontriptick, Kali and Tartar; Fern-afhes give a muddy greennefs to glafs, but Kali a clearnefs, fee *Murani*, *Nerius Meret*; and the *Florentines* obferve, that different alcali's mixt with Mercury fublimatè water, and falt of Steel give various colours.

9. 1st, Thefe falts are fiery and cauftick, till diluted; then they turn urinous by the fpittle. 2^{dly}, They are call'd urinous, becaufe when mix'd with Sal Armoniac, they fmell fo. 3^{dly}, Their colour differs. 4^{thly}, They feel unctuous. 5^{thly}, Apply'd to us they are cauftick, they whiten bones, they raife putrefaction and make flefh ftink. 6^{thly}, They effervefce with acids. 7^{thly}, They diffolve humours, but coagulate milk; diffolve gums, but corrode the lungs, &c. 7^{thly}, With oils they make foap. 9^{thly}, They make glafs with flints or fand, which by an acid may be diffolv'd again, as *Helmont* obferves. 10^{thly}, They attraft water and make it heavier, as alfo acid from the air, and become neutral. 11^{thly}, By long fufion they fly off,

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especially if you mix bone-ashes: *Boyle.* 12thly, With an acid they make a Tartar, if crySTALLIS'd. 13thly, Join'd with acid, you regain the acid spirits by distillation. 14thly, They penetrate even metallick vessels of iron and brass. 15thly, They precipitate metals dissolv'd by acids, and sublimate is redder as the Salt is stronger: *Tachenius.* 16thly, They make the juices of Violets, Turnsole, and Roses, green. 17thly, They never are in plants naturally, but are made by the fire (e). 18thly, After they run, put them upon the fire, they fly away. *See Part 1. of Menstrua.* Hence, 1. They destroy acids. 2. If they meet with acids in us, they effervesce, turn neutrals and stimulate secretions. 3. And stimulate the nerves, are good in vomitings, and acid cases. 4. They dissolve coagulations. 5. Viscosities are attenuated by them, and they take off spots. 6. And viscosities of the lymph, bile, &c. 7. Promote urine, sweats, &c. 8. They are good in phlegmatick and cold disorders, scurvy, rheumatism, anasarca's, jaundice, gout, dropsy, if well diluted. 9. They burn issues, are good in fomentations in gangrenes. 10. But are bad in alcalious blood, where the urine is red, or in septic juices, in the plague, inflammations, continual Fevers, &c. 11. Dilute them with 20 times their quantity of water, and give them warily.

P R O C E S S XIII.

The strongest fix'd fiery Salt made with Lime.

P R E P A R A T I O N.

Take Quick-lime one part, cover it with potash two parts, put a linen cloth over them, let

(e) How then comes it to pass that vitriols are precipitated by bitter plants?

them

them stand till the Lime cracks, add water four parts, let them stand and boil; strain the liquor cool'd through a *Manica Hippocratis*, then thicken this upon a fire, till it grows white, make it into what shape you please, stop them close up in a warm'd glass with cork pitch'd and bladder, keep it warm.

Its Use.

This Salt apply'd to the skin, within a little hole cut in a plaister, is a caustick that corrodes presently. A certain person falling into such a lixivium whilst boiling, it burnt him to the bones, and it wasted his cloaths too (*f*). A gentle fire melts it, and therefore it easily dissolves gums; this liquefaction may be the *Inceration* of the ancient chymists. If the Lime has flow'd in the air, it won't make this caustick Salt, 'tis then a neutral Salt, and deposits earth. It unites with oils, and turns them into Soap.

Cor. 1. The fire only produces these Salts, and when they run, they fly off.

2. These salts become more fix'd, according to the degree of fire; Mustard has a Salt, but then it is volatile and not a fix'd one.

3. This Salt is not natural, but factitious; for Sorrel has an acid Salt naturally, and a fixt one by fire.

4. An alcalious plant is therefore saline, but their Salt is volatile, as Garlick, Onions, &c.

5. Therefore there is a great variety between a natural and the many fixt Salts: Tartar distill'd gives out an acid and oils, when they are come off, the remainder is a fixt alcali.

(*f*) I doubt this person is too credulous here; for such causticks don't touch the cloaths, whether linen or woollen; the fire may.

6. Hence

6. Hence the native and alcali differ thus, the more oil, the less alkaline is the Salt; the opener the fire, the more oil exhales; the greater the fire, the stronger is the alcali; and Lime and others heat therefore with water; some also have more Salt than others.

7. Animals feed on certain aliments affording this Salt, yet their Salt is volatile only. See Salts of animals hereafter, and the reason why we meet with no fixt Salts in animals.

P R O C E S S XIV.

This fixt Salt of vegetables affords a bitter, hard, crystalline, glassy fix'd Salt, not alkaline.

P R E P A R A T I O N.

Dilute any fixt Salt with water, whether cold or boiling, let them settle, and you find this glassy Salt at the bottom.

Its Nature and Use.

It resembles Sand-ever, which swims upon glass when made, it dissolves in boiling, not or hardly in cold water, 'tis bitter and friable (g).

P R O C E S S XV.

Common distill'd water of a fresh plant, v. g. of Rosemary.

P R E P A R A T I O N.

1. We have seen what a natural heat exhales, let us now see what boiling water will elevate.

(g) 'Tis glass with some small portion of salt.

2. In the 32d, to the 36th and 86th, we shall see what fire greater than boiling water produces, now let us see what 214° produces.

3. All those Plants mention'd in the first Process will here serve the turn.

4. They are to be full grown, just before the flowers or fruits appear, in a morning, otherwise their virtues may be weaken'd or exhal'd.

5. We except where the flowers, seeds, barks, or roots are aromatick, as Roses, Lilies; Cumin, Anise, Carraways; Telephium, Caryophyllata, &c. for then these may be taken apart and distill'd.

6. Cut or bruise the plant, add water to it, put them into an alembick, let more than one third be full; lute all with paste of Linseed, flower and water, distill; fill the top with water.

7. Digest with a heat 150° for 24 hours, then boil the water with the fire under it, as you will hear by the hissing noise, or by the heat of the beak of the alembick; let it drop fast; but take care the alembick be not too hot, change then the top-water; have a care the plants stop not the pipe.

8. Let the water drop no longer, than it is milky, the clear water that follows is acid, and corrodes the still; hence change your receiver often to see if 'tis no longer thick; this acid water is a colicky poison, and is cur'd by milk.

9. The heat makes the oil rise with some acid, and makes the water muddy, the odoriferous parts are in this muddy water, the virtues reside in this water: If then the botanist gives the virtues of plants, the chymist may do it by art, and tell why they are of such virtues. In this water resides the *Spiritus Rector*, and in Mint-water distill'd there is not the whole virtue which there is in the juice.

10. The latter water has an acid in it which will corrode brass, and it is cooling: All plants have

have this acid water in 'em, which is distill'd with 215° of heat.

11. Care must be taken lest these two waters be mixt together.

Its Use.

We learn by this degree of heat what the plant parts with. *First*, The water of the first Process. 2. The volatile oil or the oil with its spirit. 3. The acid salt. *Secondly*, We know what remains at the bottom. 4. The extract of the 3d Process and all that's prepar'd from it in the 4th, 5th, 6th, 7th, 9th, 10th, 11th, 12th Processes. *Thirdly*, We know that the smell and taste reside in the volatile oil and spirit. *Fourthly*, We know what exhales by boiling in the kitchen and in pharmacy, and what remains. For Bawm and other aromatics boil'd lose their flavour. *Fifthly*, Whilst aromatics are boil'd, two parts ascend, first the aromack, then the acid. *Sixthly*, Hence we are directed to distill, for whilst the milky part comes off 'tis aromack, when it begins to be clear 'tis acid; however, plants without smell are of use when distill'd. *Lastly*, The plant, that is the solids, remains unhurt.

P R O C E S S X V I.

The common distill'd water by an alembick repeated and cohobated upon fresh Rosemary.

P R E P A R A T I O N.

1st, By this Process we are taught to make the virtues much stronger. 2^{dly}, We take all out of the still, press out the water, put in fresh herbs, and add the distill'd water along with as much more common water as will distill it. 3^{dly},
We

We close the vessels, digest in 150° of heat for three days and nights, to extract the virtue. *4thly*, We distill slower than before, when half is drawn off we encrease the fire. *5thly*, We distill so long as the water is white, and thus we get a strong and odoriferous water; the oftener we distill and cohobate, the stronger 'twill be. Thus I distill'd in 1730, 14 times, and got a very refreshing cordial water, what remain'd at bottom was austere; and if we mix these two waters, we have a compendium of the virtue of the whole plant; and thus extracts may also be made that have the whole virtue of the plant. *6thly*, Thus we have the collected virtues of the plant, which may be encreas'd at pleasure. *Paracelsus* said, they would make old people young, so said *Isaac Holland*. I have try'd such waters in myself, and have found 'em very comfortable; they are good where the spirits are affected, and in hystericks and hypochondriacks; and Mint cohobated three or four times, helps a weak cold stomach, and I have known it to take off a lientery quickly: I have distill'd such a water from the peels of Lemon, that helps flatulents and palpitations of the heart, and languors, in a small quantity; and such a water from Wormwood kill'd worms, and supply'd choler: The boughs of Savin treated thus move the menses and the hæmorrhoids, warm and move the nerves violently; and for Rue-water thus made, I know not how to praise it enough for all the virtues Rue has. Thus have I treated other plants, and have done great good therewith, I will therefore give some rules about them.

First, Aromatick, balsamick, resinous, gum-resinous, and fetid plants, such as Arbor-vitæ, Orange, and such like, dry'd in the shade, digested in 150° of heat for 72 hours, give most excellent waters.

Secondly,

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Secondly, Hard and ponderous things must be macerated in water for six or seven weeks, in 96° of heat, to which you must add a little salt to hinder the putrefaction.

Thirdly, Plants which easily give out their smell, as Jessamine, Lily of the valleys, and such like, as also Sassafras, must be distill'd immediately.

Fourthly, Astringent and emollient plants are of no use when distill'd.

Fifthly, 'Tis quite otherwise in those plants where their virtues fly off in 214° of heat, for in those decocted or extracted there is no virtue, as in Lavender, Lily of the Valley, Rue, &c.

Sixthly, In some plants there is virtue both in the water and decoction, and therefore both may be united, as Wormwood, Carduus, &c. and these being fermented give spirituous waters.

Seventhly, The acid, bitter, austere, sweet, and mucilaginous plants are best in extracts; in Chamomil and Wormwood something ascends, the Chamomil is blue, the Wormwood green; soaps afford nothing: See the catalogue of the plants of the second Process, &c. let us then distinguish between the contrary virtues in each plant: For example, the first water of Cinnamon is warming and opening, but the second is cooling and binding.

P R O C E S S XVII.

Common distill'd water of the fresh herb of Rosemary after fermentation, after Ludovicus's manner.

P R E P A R A T I O N.

First, I have already shew'd you what the fire, so as to boil water, will produce; now I will shew you how waters may be made more penetrating and volatile: For this purpose take fresh Rosemary,

mary, as in the first Process, let it be cut and bruis'd, fill a hogshead with it, so that you leave four fingers breadth empty; take as much water, fill it till it comes up to the Rosemary, put to it an eighth part of honey in the winter, and a twelfth in the summer, or sugar will serve the turn; to each pound of water put half an ounce of Bawm; this water should be put to the herbs warm, cover the hogshead, put this hogshead so as that it may be warm'd to 80°, cover it up with blankets to keep it at this warmth; the winter requires it to be nearer the fire, but the summer heat is sufficient; the second day it will begin to hiss and bubble, this motion is call'd fermentation.

Secondly, Let this fermentation continue till the plant subsides, then let the barrel cool and stop it, or the spirits will fly off.

Thirdly, Take as much of this herb and liquor as you please, put it into the distilling vessel and distill gently, for too much haste makes it boil too much: Distill so long as the water is odoriferous and milky, for the clear part that follows is of no use; in the bottom is the extract, which is of no use.

And all these things happen thus, if the fermentation be perfect, so that the herbs fall the 5th or 6th day to the bottom. This first water will keep for years, without any mother; it grows milky in water, it keeps its taste and smell; but if you mix too little honey, or protract the fermentation too long, it is not so good; at length the acid water ascends without smell, and the extract is at bottom: In the first water there is oil; if the fermentation be continued for one or two days, an oil swims at top; but the longer it is fermented, the less oil appears.

Fourthly,

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Fourthly, In the first distillation a clear spirit ascends, then a milky water, then the acid water.

Fifthly, The more perfect is the fermentation, the less virtue has the extract.

Sixthly, The oil in the first water is so attenuated, as to be call'd spirit, yet it grows milky with water, and will swim at top.

Seventhly, By a perfect fermentation these waters are limpid, the oil being highly attenuated and chang'd, and their virtues are not so good as by cohobation, nor so good if too much fermented, because the spirit flies off. Hence the spirit flying off, these are not so good as by cohobation.

P R O C E S S XVIII.

The common water of fresh Rosemary distill'd by descent.

P R E P A R A T I O N.

Distillation is only when by fire matter is translated from one vessel into another; this is done three ways, directly upwards, obliquely by a retort, and by *descent* or downwards. They take any cylindrical vessel, deep and strong, and bore it at bottom with several holes, let there be a rim that has a circular groove, and a cover for it; put the herb into this vessel, cover it with its cover which goes into a groove, clay them together, cover the top with ashes, then make on a fire, and distill into a pot under, as into a receiver, and all goes into that receiver; take care there be not too strong a fire; thus we get the water out, but it is now in disuse. *See a further description in Libavius.*

P R O C E S S X I X .

*From the remainders of Process 15, 16, 17, 18 burnt,
the saline ashes as in Process 5, 6, 9, 10, 11.*

First, If the remains from the 15th Process, both plant and liquor, be dry'd and put into a frying-pan and burnt, as in Process 6th, into white ashes, then from these ashes you may get a salt, the same as from the fresh plant; or if you take the remainder and mix it with the herb's juice and manage them as in the 5th Process, you get the same salt still; distillation then does not lessen this salt, if putrefaction do not intervene.

Secondly, If we take the remains of the 16th Process, whether juice or herb, or both, we get a salt doubly saltier and double in quantity; hence art excels nature (*b*).

Thirdly, If you take the remains of Process 17th (*i.e.* distill'd without sugar or honey, for they burn spongy and afford no salt) and burn them, you get the same salt, as Tartar from wine.

Fourthly, The remains of the 18th Process burnt produces so much less salt, as there was more papy matter in the water, which without that matter would have produced the same quantity of salt.

Fifthly, Hence, 1. The elemental water of the plant; 2. The spirit; 3. The volatile oil, in water 'tis white, alone, which swims in plants not united; 4. The acid, or vinegar of plants, 'tis

(*b*) How can this be?

even in aromatics, the fixt parts ascend not as the fixt oils, the fixt salt, and earth (i).

P R O C E S S XX.

The express'd oil of plants, as of Almonds.

P R E P A R A T I O N.

1. This oil is inflammable, altho' it grows thicker the longer it stands, as in oil of Turpentine, Wax, &c. all which melt with fire. 2. The oils in plants are various, the volatile oil holds the *Spiritus Rector* and the peculiar virtue of the plant; this once separated, the plant is no more of its usual force. 3. This oil is reserv'd in certain adipose ducts, and may be seen by cutting Firr, &c. Nutmegs, Almonds, and may be express'd. 4. This oil is for the defence of the plant from cold, and it is found most abounding, as the parts are distant from the root, as in seeds of Line, &c. 5. It is for the defence of the plant, and is found most in ever-green and northern trees, in the apples of Pine, &c. 6. It is found most in old plants, and if spring and summer be the watching of plants, and autumn and winter their time of sleep, we may say they breed oil in the time of sleep: Lime at its budding is green and all watry but when it grows brown, then it contains most oil; and the same may be said of all. 7. Hence if chymists want oil, let them gather in autumn

(i) Since from what is said in the foregoing section, distillation does not lessen the fixt salt; then they must have sixteen times as much salt, altho' the salt will be, in equal quantity, equally salt, or the author must allow of penetration of parts, which is impossible, and therefore false; there is wonder then that more salt should be afforded, but it would be strange, that the salt should bulk for bulk be stronger without a penetration of parts.

and winter; if salts and water, in spring and summer: Hence builders chuse to cut their wood in winter, because their oil preserves the wood from receiving rain; ripe seeds have the most oils, they may be powder'd with their own bran; but if they are too fat, they may be express'd by moistning their powder with the steams of warm water, and putting them into the press, and receiving their oils, as in Linseed, Almonds, Nutmegs, &c. None of these oils, tho' of Mustard-seed, are hot, but smooth; and I wonder'd at this at first, when I saw Mustard-oil prescrib'd with success for the stone; and you may be surpris'd that the *Spiritus Rector* does not manifest itself here. 9. There is so little of salt in express'd oils, that they are vulnerary and a little styptick, and so they cure fresh wounds and hinder the ouzing of matter. 10. These oils, if they grow rancid, or even are kept for some hours, from soft, anodyne, thin, insipid, sweet, and white, they become sharp, corroding, thick, bitter and yellow (k).

PROCESS XXI.

These native oils being mix'd with proper substances, become milk, chyle, emulsions, as Almonds.

PREPARATION.

1. Beat the matter in a mortar, till it grows pappy and whitish, by pouring a little water to it.
2. Pour on more water, still stirring, pour out all the milk.
3. Pour on fresh water, and thus pour in water and decant it so long as it affords milk.

(k) All these oils are one and the same, and are only diversify'd by their adjuncts; but when authors love splitting and dividing, let them take their swing: 'Tis better for the printer, but the bookseller or reader pays sawce.

4. This liquor resembles chyle, made in this manner by the stomach, it separates like milk into a thin bluish matter and cream, and it grows sour as milk does, but I never could get cheese from thence; the oil express'd does not unite with water as this does, but parts tho' shaken with water; the whiter, the more oil there is in the liquor; emulsions in summer keep not above 10 hours, but longer in winter; all corn ground, put into the mouth grows white by chewing, and is chang'd by fresh mixtures in our vessels.

P R O C E S S XXII.

Oils of plants prepar'd with water by boiling.

P R E P A R A T I O N.

1. Plants being prepar'd according to the 20th Process, sew up the remainder in a linen bag, put it into boiling water, you get oil, continue the operation till no more oil can be got by a spoon; the last Process shew'd us this oil, the water is oily. 2. But if we take the thing prepar'd by the 20th Process, before the oil is express'd, and boil in water, we get much oil; thus ℥j of Cocoa-nut bruis'd, and boil'd with ℥viii of water to the thickness of a poultis, the salt collected and cool'd was seven ounces *Homb.* and the remainder boil'd and press'd affords oil. 3. But some, as Beans, Lentils, and Pease, afford no oil thus, unless by burning.

Their Uses.

These three experiments shew the native oil in plants; and we learn from whence we have fat in us. 2. We see the use of it in plants. 3. Hence we see the nature of milk and chyle. 4. We see what essentials must be. 5. Hence we see why a vegetable

vegetable diet will make us fat, for by chewing and diluting milk is made. 6. Hence we see how our humours extravas'd grow sour; hence we grow fat with bread and water, as oxen with grass and water. 7. Hence art cannot produce more oil than nature does; these oils got by boiling and expression are not pure oils, because distill'd they divide into water, salt, foot, essential oil and earth; hence they change in the air.

P R O C E S S XXIII.

Essential oils, or distill'd by an alembick from the leaves or green boughs of Savin.

1. All plants will yield these oils, but we speak chiefly of odoriferous green, or evergreens, or decaying plants. 2. The evergreens are Fir, Arbor-vitæ, Orange, Box, Cedar, and the like, which are always full of oil, especially in fall and winter. 3. Plants that are full grown and aromattick afford these oils with more difficulty. 4. Experience shews us that these aromatticks give out more oil when gently dried, than when they are newly pluck'd, but this rule is not general, for Mint and Rosemary give most oil when fresh, so Calamint and Ageratum. 5. Some need only be put into the still with their own distill'd water, as Wormwood, &c. but others require maceration with salt or oil of Vitriol for three weeks in 90 degrees of heat, such as Firr, and all hard evergreen plants, as Savin, Box, &c. 6. Then distill as in Process 15th and 16th. 7. By this method the cases that held these oils break and the oil is driven up, retaining the natural smell and taste of the plant, which now has not its usual taste, and these are essential oils.

Their Uses.

Their acrimony is plain from their being apply'd to any wound, or if long apply'd they blister; their warming faculty is prov'd from their raising a heat, nay even sores, in us; hence they are good in all cold cases from phlegm or acid or watry constitutions, such as anasarca's, phlegmatick indigestions, colicks, intermittents before the fit, cold apoplexies; and as they refresh the spirits, they revive old men, and all actions depending on them, failures of spirits, hystericks then and hypochondriacks are profited thereby; but for plethorick or feverish cases, they are bad.

Hence we get aromattick oils by the help of boiling water; the spirit resides in these oils, and will remain, if close stopp'd up; each plant contains a certain quantity; salt makes boiling water hotter, and you get more oil thereby, but no more spirit, for that comes over easily: This oil is easier got than volatile salts, which require exustion; nothing but this oil demonstrates the plant from whence it came; we lose then much by coction.

P R O C E S S XXIV.

Distill'd oils from the dry leaves prepar'd by a still, from Mint.

P R E P A R A T I O N.

The same experiment may be tried upon Mint, which gather'd and put dry into the still, it must be half full, pour its own water to it, and we shall gain an oil, having the smell and taste of Mint, swimming upon the water; and if we press out all the juice left, and put this distill'd water to it

it again, we get more plenty of oil, and the oftner we cohobate the more oil we get.

PROCESS XXV.

Distill'd oils from the flowers of Lavender.

PREPARATION.

We take the buds of Lavender Flowers in the morning whilst the dew is upon 'em, we fill two thirds of a still, and pour upon 'em their own distill'd water (and a little oil of Vitriol) which is very fragrant; if we press out the juice and distill over again, we get more oil, and the more we cohobate the more oil we get. This oil is scarce, and must be prepar'd with oil of Vitriol lest it putrefy; thus it will give a third part more oil than usual; thus may all aromatics be treated.

Their Use.

'Tis only for the use of princes, for their fragrancy.

PROCESS XXVI.

Distill'd oils from the seeds of Fennel.

PREPARATION.

There is often a great deal of oil contain'd in the seeds, but it does not always happen that this fragrancy is in all parts of the plant, for in Aniseeds and Cummin the seeds are fragrant, in Roses only the flower, in Oranges the flower, peel and the leaves, in Cinnamon the bark only: Hence you must know what parts are fetid or aromatics, to afford these oils; then the seeds must be ripe, dried for three weeks, and digested for three days

in warm salt water, and the fire must be stronger, we must take care that the serpent or worm thro' which they distill be not too strait, and if we find a stop by the congealing of the oil, we must pour into the barrel boiling water, and if this does not do, we must cease from distilling. In warm countries their oils are very thick, as in Camphire.

Their Uses.

These oils are found mostly in the roots and seeds, for defending 'em from the winter's cold; many of these oils are not aromattick, it may be the fine spirit flies off and deceives our senses, and 'tis certain this fragrancy is soon lost, as we perceive in aromatticks imported from the *Indies*, as Cardamoms, &c. whilst Acacia, Tamarinds, Senna, &c. remain safe. 'Tis remarkable that these oils are kept from flying off for a long time, but so soon as they are water'd they are prepar'd to fly off; hence water conveys these oils to the parts.

P R O C E S S XXVII:

Distill'd oils from Cloves.

P R E P A R A T I O N.

These Cloves, if prick'd with a needle and press'd, will sweat out an oil, which is burning and odoriferous; the fresher, the more they afford: Put these Cloves into the still with twelve times their weight of water, and let them gently drop thro' the worm; when you have thus drawn off two thirds, change your recipient, and put in more water to the Cloves; and thus pour on more water, and distill so long as the water is muddy; the water that comes off clear when it has ceas'd to be muddy, is an acid water: These Cloves appear whole after

after distillation, and the merchants, by putting them among fresh Cloves, put them off to sale; they attract a fresh oil from the fresh ones. Or if this oil appears too muddy, and you fear it should, you may first digest them with salt for a fortnight or three weeks.

Its Use.

This oil is vastly heating and caustick, is good in cold distempers, in failures of spirits, &c. If this oil be expos'd to the air, it loses its flavour, and becomes a thick oil, it sinks in water, and this we have observed in the oils of Cinnamon, Guaiacum, and Sassafras; heavy as it is, 'tis lifted up with water, and 'tis remarkable that these oils should afford an acid at bottom.

P R O C E S S XXVIII.

Distill'd oils from Sassafras.

P R E P A R A T I O N.

The light odoriferous woods shav'd and put into the still with twenty times their weight of water, they afford oil and a milky water, which we must distill as long as 'tis milky, the last water being acid; you may distill fresh wood over again with the former water; the oftner we cohobate the more oil we get, the same oils are distill'd from other woods, which swim upon the water, this sinks. The more ponderous woods must be digested with salt and water, or brine, such are Arbor-vitæ, Box, Guaiacum, and such as afford *Bals. Capivi, Peru, Tolu, &c.* The longer they are digested, the more oil they afford; the more solid and ponderous afford much of this oil, the lighter the least; of this last sort are Alder, Poplar,

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Poplar, Willow, Lime, &c. those that are cut whilst they are growing afford least oil, but in the winter afford most; hence young trees afford less than old ones, and ever-greens more than others; hence those that afford most oil are best for building; wherefore the weight of these trees depends upon their oil, as does their duration and hardness; hence worms feeding upon this oil rots the trees; hence changes of weather exhale this oil, and make 'em rotten, such as Cedar, Oak, Guaiacum, Fir, &c.

P R O C E S S XXIX.

Distill'd oils from the bark of Cinnamon.

P R E P A R A T I O N.

You take the bark of Cinnamon, and distill as before; you get from thence an odoriferous oil, and also a yellow oil; you distill so long as the water is milky; but when the acid comes, you must leave off; the first water has the virtue of Cinnamon, the latter none at all. The acid water corrodes the still, and is emetick and anti-helminthick, the Cinnamon that is left is of the same colour as when put in, but has lost all its taste; but if 'tis placed among other good Cinnamon, it will re-acquire its taste, and rob the other in proportion; if you distill the remaining Cinnamon with fresh water, you get more oil by this cohobation: As this oil is worth near its weight in gold, and something mucilaginous sticks to it, it had better be distill'd with salt water or urine, or oil of Vitriol. The remainder of this Process being burnt, it affords little or no fixt salt, and the decoction describ'd in the second member of this Process affords an austere water and

and extract, and being burnt affords little fixt salt; hence 'tis to little purpose to mix this salt and its oil, in order to gain an essential salt.

Its Uses.

Chymists labour in vain, when they tell us they can draw much oil from this bark; 'tis very fiery and caustick, both externally and internally; yet 'tis very refreshing; those brought from *Ceylan* harden into a salt that dissolves in water. *Slare* tells us so in *Phil. Transf.* III. 362. However, if the bottles are not well stoppt, it loses its Force.

P R O C E S S X X X .

The distill'd oils of Cloves by descent.

P R E P A R A T I O N .

Chance taught us that plants put upon the fire, do sweat out something oily; hence a method was found out of making pitch; at length aromatics were treated after this manner. I will shew you an example. Take Cloves, bruise 'em to a pulp, put 'em into a proper glass vessel inclosed in a linen rag, fit the top to this glass, strew it over with ashes, place under it a vessel to receive this oil, make a fire of a sufficient strength, and the oil and water will descend, and the work is over.

Its Uses.

We learn by this experiment to get the natural oil, which has all the virtues of other essential oils; 'tis not got so plentifully as with water, and the remainder serves for other uses, retaining still a good deal of their former virtue. This

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is a good way to try the experiment of gaining oil on a sudden, all aromatics may be treated in this manner, and to make them sweat out of their own accord, tho' more would be got by pouring on water, those by descent are most aromatick.

Scholium.

This history of drawing of oils has very useful things in it, for Chymistry, Natural Philosophy, and Physick. *1st*, It extracts all the virtue of the plant, as to its aromatick parts. *2^{dly}*, In this oil resides the spirit which is to be distinguish'd from the oily part, and the remaining oil may be thicken'd into a balsam; hence *Bohnius* thought these distill'd oils were liquid resins, and trees that contain oil, by being prick'd, sweat it out, and at last by losing its spirit they grow into resins. Thus Turpentine loses its spirit by being boil'd; hence Gums by growing thick lose this spirituous part, and the more thin they are, the more virtue they have, because they then retain their spirit; the taste depends upon the salt, but the smell upon this oil. *3^{dly}*, The more penetrating is the smell, the stronger is the spirit of this oil; but when dry'd, they have the less of it: This spirit sometimes abounds with a small quantity of oil, and in others the oil has less spirit; this makes the difference betwixt Nutmegs and *Calamus Aromaticus*, where a pound of the nut affords an ounce of oil, and 25 pound of the latter only affords the same quantity; 'tis this spirit that gives to each particular plant its peculiar smell; I've enquir'd into the quantity of this spirit, but could not determine it: Savory and Thyme have most of it. *4^{thly}*, The oils are of various colours, brown from Mint, yellow from Lavender, golden from Cinnamon, blue from Chamomil and
Mille-

Millefolium, white from Aniseeds and Camphire, from what principle we can't tell. 5^{thly}, Some of these oils are very liquid, as of Oranges, of Lavender, of Sassafras. Others thick, as Fennel, Roses, Carraway-seeds and Camphire, but all melt with different degrees of fire. 6^{thly}, They are of different weights, the heavy ones are of Cinnamon, Cloves, Sassafras, Nutmeg, &c. others are light, as Lavender, &c. but this weight does not depend upon the consistence, for Camphire is thick but light, Sassafras is heavy but thin; that of Aniseeds stands in the water, that of Juniper subsides. 7^{thly}, These aromattick oils are hot, refreshing, attenuating, and stimulating: They are good in cold, phlegmatick, watry, intermitting cases, in hysticks and hypochondriacks, and in flatulencies, colicks, and iliack passions, and refresh the spirits of old persons; but are bad in hot and inflammatory cases, and become poisons; and all these virtues depend upon the spirit: They produce an acrimonious taste in the mouth, and applied to the skin will inflame and make gangrenes, particularly where the parts are bar'd, or to the lips, nostrils, &c. hence they refresh and heat; where people lead sedentary lives they heat not so much, they are therefore dangerous in ardent fevers, they make the spirits circulate and dissolve the blood; in this case the cohobated distill'd waters are best, the oils of Arbor-vitæ and Savin, are strong emmenagogues; of Rue, antihysterical and antiepileptical; of Juniper, antiscorbutick and diuretick; of Mint, stomachick; of Lavender, antiparalytick and antilethargick, and good in vertigo's; of Roses, cardiac; of Cinnamon, to promote labour; of Wormwood and other bitters, antiphlegmatick; of Palm and Lemons, good against palpitations from cold humours; of Marjoram, Rosemary, and Sage, against whites. 8^{thly}, These oils become limpid if

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if they are divided with three parts of salt and distill'd over again, the gross remains behind, but some part of the virtue is lost, as appears by *Homburg's* experiment, where by 26 distillations with fresh water, part turn'd into an insipid tenacious matter, but the water became very spirituous, *Hamel. Hist. ac. R. 143.* 9thly, By distilling them over again they always afford something of water, and grow lighter and more limpid, and leave at bottom something terrestrial, and *Mr. Boyle* says is turn'd most into earth. 10thly, *Burdelin*, according to *Hamel, Hist. ac. R. p. 413.* says, That by distilling five ounces of oil from 15 ounces of chalk eight times together, they got but two ounces and a dram of oil, two drams and four grains of salt, and an ounce and half of water, in which did reside a volatile salt. 11thly, By distilling a pound of oil six times from Lime, they got 15 ounces and 1 third of water, and one ounce of oil; hence do these oils consist of water, earth, salt, and a little oil. *See ac. R. Sc. 1073. p. 37.* hence oil is a compound body, but shall not define whether there be any transmutation. 12thly, I know that these fine oils being dissolv'd in alcohol and digested, and then distill'd by the heat of a 100°, they do communicate their spirit to the alcohol, and leave behind a tenacious oil at the bottom; and this they do if the distillation is repeated with a new alcohol, and then the oil is left insipid at bottom, and thick; nay, water itself being toss'd with these oils, 'twill be impregnated with their flavour, and leave the oil vapid. We see then that oils are divided into spirit and oil, and 'tis wonderful that Water impregnated with this spirit does not lose it by 20 distillations. 13thly, Hence the peculiar taste and smell of plants depends upon this spirit; 2. the smell and taste of distill'd waters depend upon this spirit; 3.

that

that of the oils also depends on this spirit; 4. the fixt oil is for the solid parts of the plant, the volatile oil supplies the spirits; 5. the express'd oils and distill'd ones are natural to plants; 6. the difference of the oils is from the spirits. See *Homburg* and *Hoffman*, from Page 1 to 63.

P R O C E S S XXXI.

Rob, produced from the remainder of the Processes from 23 to 29.

P R E P A R A T I O N.

Having got the oils off from the plant, and the more they have been call'd off the better; we take the remaining decoction, dilute it with water, strain, and evaporate to a thickness like honey, and this is *Rob*, which keeps for years; it may be made from Wormwood, &c. Juniper, &c. burn this, it makes *Tachenius's* fixt Salt; put oil to this *Rob*, and you get the essential salt.

Its Uses.

Thus we have preparations, which if blended all together again, we have the whole virtue of the plant, except of the earthy parts, viz. mix oil of Juniper with its salt and *Rob*, dilute all with its water.

P R O C E S S XXXII.

Distill'd oils, acid, spirit, two oils, coal, ashes of Guaiacum from a retort without any addition.

1st, All plants do yeild either an acid-oleous or an alcalino-volatile oleous salt; I shall speak of the acid first of the Guaiacum; 2. we put the thavings

shavings of it into a glass retort, we fit a recipient, lute it with Linseed, Flower and Water, we place it in a sand-heat of 212° of heat, and draw off an acid water, unlute and pour it out; lute again and encrease the fire, you get an acid spirit somewhat reddish; unlute, pour it out, lute and encrease the fire, and we get a red very acid spirit, and no oil; augment the fire, we get a thick black oil, and at last a pitchy oil; 3. strain these several spirits, smelling like red herrings, through cap-paper, wetting it first with the spirit, and the oil won't pass through; 4. if we pour it on chalk it huffs, if we rectify, the oil separates, if it stands also it subsides, therefore this is a mixt spirit consisting of oil, water and acid; 5. to get the oil pure, rectify with water; 6. burn the coal at bottom into ashes, and you get salt of the first kind, if the wood is fresh, otherwise none.

Its Uses.

1. We learn hence, that when green wood sweats at the end upon burning, this moisture is an acid water, that hurts one's eyes. 2. The next juice in smoke is a stronger acid, and hurts the eyes more, and dries Mint hung in a chimney and preserves it and colours it. 3. The last smoke hurts the eyes most, it is the strong acid and oil, it also preserves Mint. 4. Hence vegetables give an oleous acid water, that is penetrating, antiscorbutick, diaphoretick, &c. 5. It appears how water will cling imperceptibly to bodies, tho' they seem dry. 6. We see how without it, bodies become mouldering, and how different the body is from its components. 7. We see how water, acid, oil, spirit and earth are united to produce plants, and will last there for ages. 8. We see how the coal remains black, till burnt in the open air, so that air and fire were requir'd to gain the

the last oil. 9. All plants do the same; the vine, cut in *March*, gives an acid, and burnt, a fixt salt.

PROCESS XXXIII.

The water, spirit, volatile oily salt, oil, coal from Mustard-seeds distill'd from a retort.

PREPARATION.

'Tis well known that some plants cut or bruis'd do emit a steam, that pierces the nostrils and makes us sneeze, and forces tears from us. Such are *fetids*, as Garlicks, &c. strong acrids, as Mustard, Horseradish, Scurvygrass, &c. Tobacco and many others. 2. I put Mustard-seed just ripe into a glass retort, near fill it, join the recipient, and put fire to it, we get an acrid water and oil; keep these apart; join the recipient again, we get, by encreasing the fire in sand-heat, a light black oil and a volatile salt like hartshorn, and behind is left a spongy earth, bitter, not salt. 3. Redistill the first water, 'tis a volatile spirit. 4. Pour out the oil from the salt, and wash it with the spirit, distill, you get a volatile salt, that effervesces with acid and is like hartshorn. 5. The oils become more grateful by rectification, and also more pure. 6. The coal that remains at bottom being put upon the fire and calcin'd, affords no fixt salt; but I am told that being put into an earthen retort, it will like urine afford a phosphorus. 7. These plants agree in their analysis with animals, and afford the same principles; hence volatile salts are not peculiar to animals alone; nay they appear plainer in plants, for Mustard-seed will effervesce with vinegar, but urine of animals will not; and we get a volatile

TOM. II. d salt

salt from 'em without putrefaction. 8. Hence these plants are useful in phlegmatick, acid, and watry constitutions, and promote the circulation; consequently they're bad in inflammatory and warm diseases.

P R O C E S S XXXIV.

The separation of oils from other things in distillation, and their changes into balsams and resins.

P R E P A R A T I O N.

This separation is made several ways; first, by filtration, which is done by cap-paper folded into a conical figure so as to fit a funnel, then you wet the paper with the spirit and pour in oils and all together, the spirit and salt passes through, but the oil does not. 2^{dly}, For more precious oils you pour in all together into a glass tunnel holding one's finger at the bottom; then letting the oils rise to the top, you let go your finger gently, the spirit will run into your receiver, and thus you continue to separate till you see the oil ready to come. 3^{dly}, But if the oils are heavier than the spirit, then you do the same thing, but the oils run out first. 4^{thly}, If any thing still remains of the water above the oil, you can take it off with a thin cloth wet with the spirit.

The Uses.

1st, These oils must be kept and stoppt close and to make 'em pour better, mix a little alcohol amongst 'em. 2^{dly}, These oils grow thicker and resinous, especially if by often opening they lose their spirit; this I remember to have happened to me after keeping three or four years. 3^{dly}, The convenience of their thickening is, that the

may be kept and carried a long way. 4^{thly}, Many adulterate your best oils, by mixing 'em with oil of Almonds or Poppies whilst they are distilling, and others put alcohol to 'em: The first cheat is discover'd by mixing warm water with 'em, for then the light oil of Almonds swims, whilst the heavier settles; or by the mixture of true alcohol, which joins in with the essential oil, but leaves the other: The latter deceit is discover'd by pouring it into water, the alcohol mixes with the water, and the oil separates.

P R O C E S S XXXV.

*Vinegar, spirit, double oil, resin, and colophony;
distill'd from a retort, from Turpentine.*

P R E P A R A T I O N.

Let us now examine oil of Turpentine; put Turpentine warm'd by warm water into a pipkin till it runs, pour this into a retort well warm'd with a wide neck, so that one 3^d be empty, taking care it stick not to the neck, put this glass retort upon a sand-heat, and lute. 2. Make a fire that will heat it to 100° , and distill till nothing more comes; this liquor is gratefully acid, and will effervesce with Chalk, and is very penetrating; this first liquor is call'd the etherial oil of Turpentine. 3. Encrease your fire to 212° of heat, and you will have a spirit much like the former. 4. Change your recipient, encrease your fire, you will then get more acid water and an oil,

(1) Sugar flames, because it is oil and acid, which being let loose do always ferment or effervesce; and this is evident in so compound a body as antimony, as will appear in the sequel.

and what remains at bottom of the retort, when cold, is a hard substance. 5. By augmenting the fire we get a thick red oil, little remaining in the bottom of the retort. 6. Great caution is to be us'd in this distillation, lest the glass crack and the flames burst out, which are hard to be extinguish'd. 7. This acid water, ethereal oil, or spirit of Turpentine, is distill'd otherwise; they put Turpentine into rain-water, and distill from an alembick, you get the acid water or spirit, and the oil and the colophony remain in the still in the water, and you may render it odoriferous by putting Lavender into the still; Turpentine therefore is a compound body. 8. The more we distill, the remainder is the thicker.

Its Uses.

1st, We see in plants there is this acid water, this oil, and this balsam, which last may be made thin with the yolk of an egg; nor do these balsams differ so much in virtue as in price, for they all may be resolv'd into the same principles, thus Opobalsam, Copaiva, Peru, Tolu, Mecha, answer the same ends. 2^{dly}, In all these there is an acid water or spirit. 3^{dly}, The light oils are very penetrating, and are anodyne and consolidating in nerves and tendons; and Mr. Young the surgeon, in his *Triumphal Chariot of Turpentine*, stops a bleeding by hot oil of Turpentine: This oil preserves from putrefaction, but 'tis apt to grow thick; it discusses and mollifies, and is anodyne; internally it warms, promotes secretions of sweat and urine, gives the urine a violent smell; if you rub the spine of the back with it in quartans, 'tis often a remedy; it stimulates venery; 'tis good in gonorrhæa's, but take care of too immoderate use, lest it inflame, or produce a diabetes. 4^{thly}, The thicker oils are more anodyne and consolidating,

dating, this oil with *Glauber's* spirit of Nitre will raise a flame. 5^{thly}, The remainder at bottom is a resin that is pellucid and red, and crumbles; and if you melt this and put any insect into it, it will harden and keep like amber, so that the insect may be seen thro' it: This colophony is good in bones that are bar'd, or in tendons and muscles that are hurt by burning; it stops a sharp flux of humours that flows from the joints, and is styptick. 6^{thly}, The acid is the same as in other plants; a balsam is chang'd into resin by expelling the water, the acid, and the oil; thus we see it happens by the heat of the sun, and winter makes resins of oils. 7^{thly}, Hence, 1. The great heat of the sun changes oils into resins. 2. The heat of boiling water does the same. 3. This colophony with 280° of heat, will turn into acid and a red oil, and there remains a very hard colophony at bottom; however, by a heat that will almost melt glass, this colophony is melted into oil. 4. We see therefore the force of the fire upon oils, by a small degree of heat they are evaporated to a thick consistence, but by a greater into a thin substance.

PROCESS XXXVI.

Water, vinegar, fetid spirit, and butter, got by distilling wax from a retort.

PREPARATION.

1st, There is a sort of balsam upon *Rosemary* and some other plants, which can hardly be gather'd by us, but may be view'd by a microscope; wax therefore seems to be a sort of *Turpentine* gather'd by bees, and pedefactur'd into honey and wax by them. 2^{dly}, Cut such wax into
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small

small pieces, put it into a retort, make it half full, put it upon a sand heat. 3^{dly}, Distill gradually, and the acid water and spirit will come forth. 4^{thly}, When by 214° of heat no more comes out, change your recipient, and a thin oil, hardening afterwards into butter, will come up: Always remember to mix sand with the wax, to hinder its expansion.

Its Uses.

Wax therefore resembles Turpentine, and 'tis all inflammable. Melt wax in boiling water, pass it thro' a linen cloth, spread it into small fleaks, expose it to the air, sprinkle it often, it becomes white wax; hence oils are manifold, as oil, balsam, resin, pitch, tears, wax, butter; the fire makes oils to appear; this butter never returns into wax, as I found by keeping it for 20 years together, mean while oil of Turpentine will return into Turpentine, and Camphire never becomes a liquid oil: This butter is very emollient, anodyne, and relaxing, is good therefore in contracted members and pains of the hæmorrhoids.

P R O C E S S XXXVII.

The manner of turning butter of wax by repeated distillation from a retort into a liquid oil.

P R E P A R A T I O N.

Melt this butter, warm a glass retort, put it into it, taking care it stick not in the neck, fill it half full; join a recipient, give a gentle fire, so that the oil drop one drop in 6 seconds, encrease the fire gradually till all comes over liquid; rectification makes it more liquid.

Its

Its Uses.

The fire melts this butter and makes it milder ; it is good in chopp'd nipples, or any where in rigidities and contractions ; it lubricates the fœces, and externally helps children that way, and relaxes the papillæ nervosæ of the skin.

P R O C E S S XXXVIII.

Medicated Eleosacchara.

P R E P A R A T I O N.

1st, Physicians having found out that the spirit of the oil contains the whole virtue of the plant, they then begun to think how to blend them with water ; they took therefore the fine sugar and made an impalpable powder of it, to one ounce of this powder they gradually pour'd on a dram or a dram and half of essential oil, and rub'd them well together till all was dry. 2^{dly}, If you add a little yolk of an egg 'twill dissolve the better, but then it grows rancid. 3^{dly}, This, like soap, mixes easily with water ; neither need we fear the damage from sugar, which is balsamick and wholesome, being known to consist of oil and salt, and is easily to be converted into wine. 4^{thly}, This method is useful for conveying these oils entire in journies, when well stopt ; we may in the same manner mix them with an alkaline fixt salt, and they then make a soap, but their flavour is taken off ; if the eleosaccharum of Mint be put into Mint-water, adding a little of the spirit of Mint, sweetning the mixture with the syrup of Mint, we have the whole virtue of the Mint.

Its Uses.

Hence appears the saponaceous virtue of sugar fit for dividing the oils, which does not lessen the virtue of 'em; the ancients mix'd it with honey, having no sugar; sugar dissolves phlegm, does not encrease bile; by dividing the oils it may bring on a leanness, and by too great attenuation a debility; hence it is bad for rickets and scurvy. Sugar dissolves in water, melts in the fire, crystallizes, is fattish, affords an acid spirit, may be made into wine, and turn'd into vinegar: Is it a salt, why does it burn in the fire? Is it an oil, why does it crystallize? Is it an essential salt, why does it ferment? There is nothing like it in nature.

P R O C E S S XXXIX.

Diet-drinks from Process the 9th to 15, 18, 23, 31.

P R E P A R A T I O N.

1st, Take a dram of eleosaccharum, two drams of salt of *Tachenius*, mix 'em well in a mortar, then add six ounces of the distill'd water from whose oil you had made the eleosaccharum, mix a little of the syrup of the same, and you will have the collected virtue of that plant, the salt does not abate the virtue. 2^{dly}, If you know the virtue of the original plant, you have its virtues concentrated.

Its Uses.

The dose is to be regulated by the quantity of the oil, it must be given upon an empty stomach; in a tertian fever, two hours before the fit, let the patient bathe his feet and legs with a warm bath, then

then every quarter of an hour throw in water of Wormwood thus impregnated, then rub their feet and legs very well, let these be continu'd till the two hours, you expected the fit, are past; and thus they are all cur'd, even in old age, unless there be a scirrhus or some impostume; thus, Tansy is good in the worms, manag'd in this manner.

P R O C E S S XL.

Scented balsams made from these distill'd oils, wax and pomatum.

P R E P A R A T I O N.

Take pomatum an ounce, mix upon the fire a dram of white wax, melt them, pour in a dram of essential oil, stirring them that they may be mixt, pour them into cold water, and put 'em into boxes; express'd oil of Nutmegs may be wash'd in water till 'tis white, and may be made with the oil in the same manner into a balsam: If we have a mind to make this balsam red, add Cochineel powder'd finely; if green, the juice of Buckthorn; if scarlet, Cinnabar; if yellow, Turmeric; if blue, Smalt.

Its Uses.

They are for the gratefulness of smell, and to excite the stupid; any aromatics, such as Oranges, Rhodium, Cinnamon, Mace, Nutmegs, &c. will serve the turn.

P R O-

P R O C E S S XLI.

Any flower, even malt, distill'd, gives an insipid water.

P R E P A R A T I O N.

Take any flower, even of corrupted corn, as *Tacitus* calls malt, make it in a paste with water and distill, you get nothing spirituous from thence.

Its Uses.

Hence it appears there is nothing volatile in vegetables before fermentation; they afford a water that extinguishes fire, and that does not nourish (*m*).

P R O C E S S XLII.

Honey diluted with water and distill'd, affords a water smelling of honey only.

P R E P A R A T I O N.

Take fine honey one part, clear rain-water six parts, mix 'em well and distill from a glass retort on a moderate fire; the vapour arises, and drops not into streaks but water, altho' you should draw off two thirds; the smell is not winey but fragrant; throw this water upon the fire it extinguishes it, and taste it, 'tis insipid.

(*m*) *N. B.* All grain whatever will afford an acid and oil before fermentation, and 'tis the fermentation that divides and attenuates this oil into spirit.

Its Uses.

Wherefore in this there is no such spirit afforded us by fermentation, nor does it attenuate or deterge; but mulsā, or honey and water, is attenuating, stimulant, and purging: This mulsā then is good in collyria, for inflam'd eyes; the same may be said of the decoction of Cassia, Manna, Sugar, and Tamarinds, which being mix'd with water and decocted, give no vinous spirits; the same may be said of fruits and other vegetables.

The history of fermentation.

The name of fermentation is of too general use, and 'tis taken for any change; *Bellini* complains that the chymists are too full of their ferments, and that *Helmont* attributes all to it. *First*, I understand by fermentation that change made by an intestine motion which produces inflammable spirits: Thus we limit fermentation, by it we understand such an intestine motion as is rais'd between the principles of any body; heat is requir'd in this affair, but there must be also an aptitude in the body to ferment, for none of 'em will ferment apart; this motion is only in plants, and is not found in animals, unless they have receiv'd vegetables into their fluids; 'tis never found in fossils: Fermentation terminates either into an inflammable spirit or an acid, wherefore nothing can be said to be fermented that does not produce these two effects; putrefaction makes oils and volatile salts, that intestine motion therefore which is found in animals produces not acids nor inflammable spirits, but phosphorical ones, therefore

fore different from fermentation ; (n) nor is effervescence betwixt alcalis and acids to be call'd fermentation, tho' it be an intestine motion. 2dly, This fermentation produces winey liquors, and they afford brandies and vinegars. 3dly, Vegetables only are fermented with liquors, altho' all of 'em are not fermentable. 4thly, 'Tis evident this ferment is only lodg'd in vegetables. 5thly, There are various fermentable vegetables, and altho' all fermentable bodies can be putrefied, yet they cannot all be fermented ; Onions and some others afford a volatile salt, but no brandy spirit : There are two classes of fermentables, the first are the seeds of plants that will powder, and these are divided into three sorts : 1. Culmiferous plants, those that bear grassy leaves and have ears, as all Corn, Linseed, Melons, and several others. 2. The seeds of leguminous, filiquose and papilinaceous, such as Broom, Mellilot, Fenugreek, Vetches, &c. 3. Nuts not too oleous, as Almonds, Hazel-nuts, Walnuts, Cocoas, and Pistacios, which if they are too oily, they are first to be depriv'd of it by sprouting or the fire. 7thly, The second class is where there is dulc-acid, as Cherries, Gooseberries, Mulberries, Elderberries, Raisins, &c. 8thly, All succulent plants, so they taste acid, not acrimonious. 9thly, The fourth class contains the juices of plants or fruits, as also of Birch, Walnut, and the Vine, for all these ferment of themselves : *Helmont* and *Boyle* commend the Juice of the Birch against the stone. 10thly, The fifth class contains sweet things, as Honey, Manna, &c. 11thly,

(n) I ask this professor, How it comes to pass, that from the dregs of wine or beer distill'd, we can afterwards produce volatile salts and oils ? Moreover, putrefaction and fermentation are both effects of an intestine motion ; fermentation does not touch the volatile salts.

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doubt whether river-water may be referr'd to this head; as to ditch-water, if 'tis included in hogs-heads that have contain'd fermented liquors, they may be in some measure fermented, as appears under the *Æquinoctial* (o). 12^{thly}, There are some physical conditions requir'd to fermentation, 1. The things to be fermented must be ripe. 2. They must not be too oily, but when they are macerated in water and left to sprout, then they lose much of their oil. 3. Austeres and stypticks are unfit for this work. 4. They must easily be dissolv'd in water, therefore their juices are most easily fermented. 13^{thly}, The ferments are, 1. Those things which are apt of themselves to ferment, as ripe fruits and paste made with water of corn, &c. 2. The barm and froth of fermented liquors, if fresh. 3. This froth itself, when 'tis turn'd into a mass, will yet ferment. 4. Cassia, Manna, Honey, Sugar, and such inspissated juices. 5. The sour paste of corn, &c. this flower, if kept in a dry place and from insects, will keep uncorrupted for years; but if moisten'd with water and kept in a warm place, it ferments and proves a ferment. 6. The remains of liquors in hogs-heads. 7. The white of an egg beaten to water, which of itself is properly no ferment, but takes off the viscous impediments. 8. Some have referr'd hitherto acid, austere and alkaline salts; acids hinder the putrefaction, and alkalines, the acid; so that they are not properly ferments, but take off the impediments: Tartar, if good, is a ferment. 9. Austere bodies will serve as ferments, as Quinces and ripe Medlars, and sour Cherries; but these are only used when the spirits are apt to

(o) N. B. This opinion of the professor destroys his own sentiments, for 'tis properly an oil produc'd by putrefaction, for no water will flame unless it first smells.

fly off. 14^{thly}, We will now consider how to prepare bodies for fermentation; the things to be fermented are to be put into rain-water in large vessels in the summer time till they swell, this is call'd maceration. 2. They must be taken out and laid in great heaps in an open place till they begin to heat and sprout, but care must be taken that they do not putrefy, or bud into little roots. 3. The matter must be spread lest it grow too hot, and must be dried in a kiln; this is call'd malt: Thus the juices of the corn are attenuated and will easily melt, and have contracted a sweetness; then it must be ground, and all corn must be treated thus. See *Phil. Transf.* N^o. 142. and *le Febvre*. 15^{thly}, Those of the second class must be trodden or press'd, or reduc'd into pulp, or shav'd and beaten in water; thus are heated Grapes, Apples, and tuberose roots. 16^{thly}, Those belonging to the third class must be beaten to the form of a pulse. 17^{thly}, The fourth and fifth class must be diluted with water till they will hold an egg; if they are too thick, they will not ferment, and the same happens if they are too thin. 18^{thly}, We must now consider the ferments, which are often useless in summer, but in winter they are requisite; for example, an ounce of Barm will suffice for 20 pound; Honey or Sugar will serve in the same proportion: the second class, unless in cold weather, requires no ferment, and then a little Barm will suffice: the third class also ferment of themselves, unless in winter, for then Sugar or Honey will serve the turn; the fourth class rarely requires any at all: the fifth class admits of none. 19^{thly}, All fermentables being thus prepar'd, and diluted with water, put them into an oaken vessel where liquor has been fermented before, let them stand in a heat between 60 and 70°, leave the hogshead open, or cover it with blankets. 20^{thly},
tak

take glass cucurbites pretty large, I place them erect in a wooden chest, I place a small fire at bottom so as to continue a heat between 60 and 70°, I fill these glasses 3 quarters full of fermentable matter, well prepar'd, I cover them with a cloth, even in winter, and you see how they ferment; 1. we see the matter swells and moves all ways, and is capable of bursting vessels, and strikes your nostrils; 2. all the matter being under a continual agitation, crackling and bubbling, frames a crust at top of tenacious matter; 3. after all this commotion, the fœces settle and a crust remains quite at top and the liquor grows clear. 4. In the first degree of fermentation then, the matter is confus'd and the Barm rises; in the second there is a separation into three parts, the Barm, the liquor, and dregs, in the last are the strong liquor and the dregs. 5. The spirit of the liquor is so strong, whilst under fermentation, that it kills suddenly, and the same is said of sugar; *Phil. Trans.* inso-much that vintners never enter their cellars without opening all their windows; what this spirit is we know not, but it unites to the liquor when the fermentation is over, hence spirit of wine is full of this spirit that kills. 21st, The time requisite for a perfect fermentation is determin'd by the seasons; in *Africa* the Palm soon runs this course, in the north it proceeds slowly; when it has done working, keep the liquor upon its lees, and it grows stronger and clearer. 22^{dly}, This liquor is call'd wine, &c. every where, whose nature is to fuddle, chear, cause stupors, &c. and tho' Opium stupifies, it does not besot; it warms and corroborates; the juice of fruits, barley, &c. eaten, do raise flatus's, &c. but fermented they cure the very disorders rais'd by the former; new liquor of the vine unfermented raises dysenteries, but wine drawn into spirit helps them; no other liquor;

liquor affords a brandy spirit till fermented, which yet will be diluted with water, which phosphorus when in flames does not. Tartar is the essential salt of wine, and peculiar to it alone; fermentation gives a brisk and *dolce-picquante* taste, which when unfermented is sweet; Aloes and Coloquintida fermented lose their bitterness; there is no difference between *French* brandy and spirits, so that its taste is new as well as virtues: The spirits of fermented things differ much; the *Spiritus Rectior* is lost in brandies, and oils do not mix with water as brandies do; Rosemary fermented half way and distill'd, gives out some oil, but if quite fermented and distill'd, all the oil is gone, so that fermentation takes away the essential oil; this essential oil becomes by fermentation more volatile than water. (p) The following conditions are requir'd for fermentation: 1. It must be so quick as not to break the crust at top; 2. a free admission of air; 3. a warmth between 60 and 80 degrees; 4. spring and fall. 24^{thly}, Hence the following circumstances hinder it: 1. Any acid in steam or liquor; 2. any alcali put into it in a large quantity, it makes all huff up, but then the liquor putrefies, but ferments no more; 3. hence Chalk, Iron, Tin, Lead, &c. hinder it; 4. stopping up the hogsheads too soon; 5. cold of 30 degrees; 6. heat above 90 degrees, it inspissates the liquor, so boiling the juice of grapes hinders it and renders it unfit ever to ferment; 7. drawing off the elastick air by the air-pump; compression stops it presently. 25^{thly}, If you design to get brandy from the fermented liquor, let it not be

(p) The essential oil by fermentation loses its cohesion, and unites with water; hence is there a greater attrition made use of by such an agitation, than by any other method.

done

done just after fermentation, for fear of Expansion; and mix the settlings along with the liquor by boiling it and stirring, and then you get stronger spirit, and without danger of Empyreuma. 26thly, To prevent burning or Empyreuma, 1. anoint the still with some fatty substance; 2. shake all well together before you put it into the still; 3. boil some water in the still before you put in your liquor, and this hinders any thing from sticking. 27thly, By jumbling all together, you get good spirits. (q) 28thly, Take care of the first force of the liquor's boiling, by leaving one third of the pot empty, and by covering the neck of the pot with a thin cloth clapping on the alembick. 29thly, The first of the liquor is hot, volatile, flames, fuddles, besots, heals the nerves and tendons, preserves from putrefaction, when it is not quite alcohol but sweeten'd with sugar, it keeps things tender, if mix'd with water and vinegar; 'tis an excellent discutient in gangrenes, &c. dissolves coagulations, &c. 30thly, Next comes up an acid water, and dregs remain at bottom thick, and affording an empyreumatick oil. 31st, And being burnt affords a subcaline salt; hence fermentation can't make all parts volatile. 32dly, Behold, most worthy hearers, the whole history of fermentation in all its circumstances, let us no longer confound fermentation with any other operation; thus we shall no longer confound the action on animals and fossils with this; fermentation is begun indeed in the stomach and guts, but breaks off there and putrefaction ensues; hence let us distinguish for the future between effervescences, ebullitions and putrefactions. (r)

(q) See Caution 2d of 26.

(r) They are both species of intestine motion, which word includes them both; fermentation is an intestine motion rais'd between the oils and the acids, and putrefaction between

P R O C E S S XLIII.

Meal and Malt moisten'd with water enough do ferment.

P R E P A R A T I O N.

We will now give examples of fermented liquors: There are two methods of making beer and its spirit; the first is thus: Take ground malt, pour upon it boiling water, let them infuse, then draw it off, boil it to a thickness, which is call'd *wort*, 'tis sweet and relaxing, boil some bitter herbs in it, then add Barm and work it 'tis Ale and Beer; distill it, you get a spirit. This *Diodorus Siculus*, l. i. knew; this *Herodotus* calls fermented wine from brandy; *Tacitus* also speaks of it, *Aetius* calls it *Byne*. The common way is, Take ground malt ℥xxxiv. Rye-meal ℥vi. steep them in water that boils, put them into a barrel, keep it warm, they ferment, leave them till they have done fermenting, shut the barrel the liquor will be clear.

P R O C E S S XLIV.

Honey diluted with water ferments.

P R E P A R A T I O N.

Take honey, dilute it with such a quantity of water as an egg will swim upon it, 'tis call'd *mul*. fill a hoghead with it standing upright with a hole on the side to draw the liquor out, put the hoghead into a wooden case in 70 degrees of heat, it begins to ferment, and makes at last mead.

P R

P R O C E S S XLV.

Malt and meal fermented distill into spirits and vinegar.

P R E P A R A T I O N.

Pour into the distilling pot a pint of boiling water, upon which pour in the fermented liquor of the 43^d Process well shaken together, leave one 3^d of the pot empty, kindle the fire under it and stir the liquor well about, when 'tis near boiling clap on the alembick and distill so long as brandy comes ; but as soon as the liquor becomes white, the acid spirit comes forth.

Its Uses.

This first spirit is the fermented one.

P R O C E S S XLVI.

Mead produced by fermentation distills into brandy, vinegar.

P R E P A R A T I O N.

Put the mead well fermented into the pot with all the foregoing cautions ; the first spirit that comes is the brandy, the next is the acid white spirit.

Its Uses.

Thus we gain brandies and an acid spirit, what remains at the bottom of the pot will never ferment again, but turns acid.

P R O C E S S XLVII.

Depuration of the spirituous liquors got from fermented bodies. .

P R E P A R A T I O N.

Take any spirit, fill the pot two 3ds full, clap on the alembick and distill; it must often be tasted to know the strength of it, the strongest comes first, and the acid water last; and a thick acid humour remains at the bottom, which is red from red wine.

Its Use.

The oftner we distill the more pure is the alcohol; spirit of wine contains brandy spirits, water, and an acid, which may be separated by the 49th Process; hence the effects from common spirits are such as are not much to be ascrib'd to the spirit of wine, we cannot affirm that these spirits are either alkaline or acid; however let us distill ever so much 'tis a compound body.

P R O C E S S XLVIII.

Alcohol from fermented spirits without any addition.

P R E P A R A T I O N.

Any fermented spirit distill'd in 100 degrees heat from a high streight-necked glass cucurbit by a gentle fire to one half; distill this again, so often that what remains is as strong as what you call off; this is true alcohol, however the strongest alcohol has some water in it; m

Moderns have found another way of distilling it : put spirit of wine into a distilling pot two 3ds full, place this in boiling water, clap on the alembick with a worm to it and distill, thus the spirit will distill without the water : See the description of this furnace among the figures, however some water comes up this way ; redistilling of this makes it as pure as it can be, for still there is water in the spirit not to be separated from it. I try'd this distillation in the following manner : I fill'd the pot half full with alcohol of the first distillation, I added to it half a pound of decrepitated salt, I clapt on the alembick and luted it well, and left 'em for 12 hours in so small a heat that they could not boil, then I distill'd two ounces and kept it apart, lest there should be any water sticking to the sides of the worm, then I force up the remainder ; the salt remaineth at bottom, and does not spoil the spirit.

Its Uses.

This alcohol is a fine liquor, lighter than any body but air, flames all away without smoke orregs, never is chang'd by re-distilling, it coagulates animal juices in a moment, and hardens the solids, preserves bodies from putrefaction, and will keep for ages ; it mixes with any liquors, dissolves gummosse bodies and extracts tinctures from thence, and is owing to fermentation ; it refreshes the spirits, but excites drunkenness ; outwardly it corroborates, and dries and contracts ; hence alone 'tis not proper for fomentations without Camphire, &c. because 'tis so caustick and drying ; and if it is us'd to nerves lacerated or punctur'd, it eases their irritations by proving caustick : It stops bleeding in a moment, it preserves bodies put into it from putrefaction : That we may know pure alcohol ; first, if any oily bodies

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dies are contain'd in it, it grows milky in water; if any acid be in it, spirit of salt Armoniac will effervesce with it; if any alcali be in it, acids will ferment with it; and to try whether there be any water in it, we kindle it, if it all evaporates, there is no water, or if it fires gunpowder; or take a chymical glass, with four or six ounces of alcohol, put dry salt of Tartar to it, a dram gently warm, if the salt of Tartar is not wet, there is no water; but this seldom happens: We can go no further with fermentation than to produce alcohol.

P R O C E S S XLIX.

The making alcohol with alcali's.

P R E P A R A T I O N.

Put common spirit of wine into a glass cucurbit, mixing with it one 3d of pot-ashes, shake the glass and the liquor swims red at top, and the salt is moist at bottom; the more you shake the moister the salt grows. Let them stand and settle, put in more salt, do as before; repeat this in a heat of 100° till the salt remains dry at bottom; the liquor is red, and effervesces with acids the salt becomes of the taste of *Terra foliata Tartari*, and 'tis remarkable that an oily substance comes either from the spirit or salt, or both.

Distill this so prepar'd, and you get a clear pure alcohol, especially if you drop in as much oil of Vitriol as till it ceases from effervescing.

It is then hard to acquire pure alcohol, for tho' the alcali takes off the water, acid and oil yet it leaves it salt.

This is the utmost purity that we can bring alcohol to; it never changes by any further attification.

tifice; this is the *Samech Paracelsi*; for the rest, we shall speak of it in the 80th Process.

P R O C E S S L.

The origin of vinegar.

Having consider'd alcohol, let us now consider how vinegar is made. To make vinegar, wine must first be made; if fermentation be carried too far, the wine turns sour, but it must be put into a hoghead that has had vinegar in it: All wine is apt to turn into vinegar, the stronger the wine the better the vinegar; the best ferments are first the dregs of sour wine, or of vinegar, or the tartar of some wine reduc'd into powder, or vinegar it self pretty tart, or hogheads that have held vinegar in them, or the frequent repetition of the dregs put into that hoghead, or the stalks or skins of Cherries and such sour plants, or leven, or all these compounded together.

Glauber describ'd this history heretofore, which has since been communicated to the Royal Society, which I shall here repeat to you: You take two hogheads, in each of which you make a grate a foot high from the bottom, upon this grate you place vine-twigs up to the top, you put wine above these so as to fill the one full and the other half full, you fill that which is half full with the liquor of that which is full; you keep 'em upon a moderate heat, and thus you change alternately, they ferment and the liquor grows sour; the warmer the weather, the quicker is the fermentation; the stronger the wine, the better is the vinegar; beer vinegar is as good as wine vinegar (s). See *Phil. Transact.*

(s) The professor's taste is extremely bad, to recommend beer vinegar to be as good as wine vinegar.

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Vinegar then is an acid oleous liquor, that extinguishes fire; the spirit from wine flames, the vinegar from wine extinguishes; 'tis said that vinegar is the tartar of wine. As to its nature, I shall observe the following things; 1st, 'Tis a volatile oily acid that resists putrefaction, and is very penetrating and mixes with all the humours of our bodies, not oil excepted: 'Tis good in bilious fevers, and quenches the thirst arising from venomous bites; it was used by the ancients mixt with honey, and then was call'd *Posca* or *Oxycrate*. Surgeons use it for erysipelas's, phlegmons and putrid ulcers; and 'tis efficacious in the hydrophobia: It checks drunkenness, helps lethargick people, and quells vomitings, and is good in syncope and in convulsions; in hypochondriac and hysteric people, as also in gangrenes, as it preserves from putrefaction; nay, it has an attenuating power, let others think what they please, this I affirm; for if it be mixt with the serum warm, it dissolves coagulations, and is excellent good in the small-pox and meazles, plague and ardent fevers; and is an excellent remedy to dissolve the coagulations produc'd by such diseases, where volatile salts are given with great danger (*u*). *Sylvius* relied upon it against the plague; we do not know a better sudorifick in pestilential cases; 'tis a mixture of acid and the brandy spirit; the spirit of wine is converted into the nature of the vinegar (*x*); perhaps it is the tartar of the wine join'd to a little oil; in the distillation of wine the spirit comes first, but in the distillation of vi-

(*t*) This were an excessive ignorance to recommend vinegar in a stagnation, which, as I have experienc'd, a rabies produces!

(*u*) I have never heard of such paradoxes in practice in my whole life.

(*x*) Therefore transmutation is possible.

negar

negar the water comes first: We see then the preparation of this four from the sweet of wine; warmth, free air, motion and mixture of aromatics, help the production of vinegar; and all those things which hinder fermentation, except motion, do hinder the production of vinegar (y).

P R O C E S S L I.

The distillation of vinegar into an acid water, an acid spirit, an extract, tartar, and an oil.

P R E P A R A T I O N.

Put vinegar into a glass cucurbit three quarters full, distill gently till one 4th part comes over; this is gently acid, and *Vigani* tells us, that the first that comes over is brandy, and upon trial I have found it so with *French* vinegar, viz. it was like common brandy join'd to a little acid; but when this vinegar was old, it was not so, the spirit was gone off; what remain'd I distill'd off to two 3ds more, the liquor was still more acid, and was truly spirit of vinegar, and the one 4th that remain'd in the still requir'd a greater fire, and was very acid; what remain'd at the bottom of the retort afforded by a very strong fire a very ponderous fetid acid, and at length an oil; the remainder being burnt, gave a fixt salt: From whence it appears there is no alcohol in vinegar, nor any tartar, and it differs from all acids whatever: For common use we distill it from a brass pot tinn'd; the first 4th part we keep apart, the other two 3ds remaining we draw off for spirit of

(y) This author does not know what to say of vinegar; this reminds me of what is said in the *Journal des Scavans*, *Voilà une certaine Rhetorique Pedantesque qui consiste à parler beaucoup et à ne rien dire.*

vinegar,

vinegar, and the last part left behind we keep for the strongest spirit.

Its Uses.

Its uses are the same, but stronger than those of vinegar; the magma left at bottom after seven 8ths are drawn off, is an excellent remedy against putrefaction, 'tis of a soapy nature: Who wou'd believe so much oil is in vinegar, or that a soapy substance shou'd be got at bottom, or that it wou'd make lead into a sugar, or that this sugar of lead wou'd afford brandy, unless you say that lead is combustible? but vitriol of lead prepar'd with spirit of nitre affords no brandy; distill'd vinegar put to salt of tartar, the acid and the salt unite and leave a brandy, as in Process 76, and 'tis strange that an acid shou'd afford an alcali.

P R O C E S S LII.

The Rectification of distill'd vinegar by itself.

P R E P A R A T I O N.

Take the distill'd vinegar of the last Process, put it into a glass cucurbit and distill it to half, that which comes over is not very acid, that which remains in the cucurbit is the strongest.

Its Uses.

In the distillation of wine the strong spirit comes first, but in vinegar the weak; hence boiling makes wine vapid, but vinegar stronger; vinegar by boiling flesh, cartilages, bones and skins in it, reduces them to a thick liquid; metals require the strongest.

P R O-

P R O C E S S LIII.

The rectification of spirit of vinegar with verdigrease.

P R E P A R A T I O N.

Pour upon verdigrease rectified distill'd vinegar to 10 inches high, place 'em over a fire of 150° in a glass cucurbit, stir them well together, the vinegar will be died green; pour this out and put in more, and thus continue to do whilst the verdigrease tinctures the vinegar. *N.B.* Verdigrease is only the rust of copper produc'd by the raisins press'd. Filter all these liquors, and distill them in 200° of fire from a glass cucurbit till a pellicule appears at top; the first liquor that comes off is but little acid, and the remainder being plac'd in a cellar, you gather the crystals; the remaining liquor must again be evaporated to a pellicule and then you gather more crystals, and thus you proceed till you have gather'd all; this is call'd distill'd verdigrease, 'tis an escharotick; you take these crystals and distill, the first that comes over is weak, but the last is a very strong acid, and is call'd by *Zwelfer Acetum Esurinum*.

Its Uses.

This is the strongest fermented acid, and restores the appetite in bilious constitutions, but is bad in acid ones; absorbents take off its force; distill'd vinegar is an acid and water, verdigrease licks up the acid and leaves the water behind; this acid joins with the copper into a solid, but being call'd off, it leaves the copper in powder unchanged; this in dissolving lead and iron does not happen, for from them, as well as from fixt salts
or

or volatiles, we can recover no vinegar; so that copper is the only one that returns it (z).

PROCESS LIV.

The production of tartar from wine.

PREPARATION.

This tartar is produc'd after the wine has been thoroughly fermented and stood; such is the colour of the vine, such is the tartar; see the 8th Process. This tartar does not dissolve in wine, or in water, but in boiling water 'tis dissolv'd into cream of tartar, which swims as a pellicule at top, and is gradually taken off with a spoon with holes in it; or if you boil tartar in 20 times its quantity of water till 'tis dissolv'd, and pour it into a wooden vessel, it grows into crystals; this salt is different from all others.

Its Uses.

The 8th Process and this illustrate the nature of fermentation and its product, *viz.* Tartar: driers, goldsmiths, chymists, and physicians use it much; this cream is gently purgative.

(z) This is a great mistake, for from all bodies whatever we can again recover the vinegar by a strong fire: The stronger are the bodies, the harder it is to recover any acid; but it is recoverable, which is what the professor denies: So far will men run to favour an *Hypothesis*.

PROCESS LV.

Tartar resolv'd by distillation into water, acid, spirit, oil, and fixt salt.

PREPARATION.

Put white tartar broke into little pieces into a glass retort so that one 3d remain empty, place it on a sand furnace, fit to it a large recipient, lute with Linseed, flower and water, put under it a fire of 100° , and you will first get an acid water that will penetrate through the lute, keep this apart; increase the fire to 212° , the white vapour that comes up, sweats through the lute, and if you had made use of a stronger lute, it would break the recipient: Along with this spirit comes up a yellow oil which sweats through any lute, nor cou'd I ever hinder it: This oil is good in contractions of the membranes or tendons. These being taken away, lute the recipient again, you gain more spirit and a black stinking oil, and at bottom remains the black tartar, which heats as soon as expos'd to the air, and by being calcin'd becomes salt of tartar, that melts in the open air, and is alkaline.

Its Uses.

Fermentation therefore produces strange things, first, a subtle liquor call'd wine, then a stone not dissolvable in water, which produces the various things in this Process; one would wonder where all these things lay hid, or how the fire should turn it into an alkaline; re-affuse these liquors to the black tartar, you regain nothing but a little oil; the first oil is very penetrating and discutient, and good against contractions; and when rectified,
'tis

'tis commended against gouty nodes: Some say it returns decay'd flavours, as a jakes does that of Musk and Civet; this fixt salt is most plentifully found in tartar, and 'tis the strongest of them all; this black tartar expos'd to the air makes an oil of tartar *per deliquium*.

P R O C E S S LVI.

The tincture of gum lacca by 12, 55, 47, 48, 49.

P R E P A R A T I O N.

Beat gum lac to powder, moisten it with oil of tartar in an urinal, dry this gently in the first furnace, then expose it to the air till it run, dry it again, thus do often over; then pour in alcohol to four fingers height, stopping the glass with a paper plug, put it on the same furnace till it nearly boils, let the liquor cool, pour it off, pour on more spirit of wine, this repeat till it affords no more tincture, let them subside, then distill off half the spirit of wine, keep the tincture.

Its Uses.

Hence this hard body is dissolv'd, and thus we gain all tinctures; it heats and exagitates the nerves and spirits, resists putrefaction and constricts the vessels; hence is this tincture good in the scurvy of the gums, and internally may be given in cold distempers, as scurvy, gout, rheumatism and dropsy, and in the *fluor albus* thrice a day in *Spanish* wine.

P R O C E S S LVII.

Tincture of myrrh after the same manner.

P R E P A R A T I O N.

Proceed as in the last process.

Its Uses.

'Tis good in ulcers, because it deterges; 'tis good for embalming; 'tis useful in all cold watry diseases and relax'd fibres, as also in the *fluor albus*.

P R O C E S S LVIII.

Tincture of amber in the same manner.

P R E P A R A T I O N.

Powder amber, then add oil of tartar, beat it into a pulp, pour on spirit of wine, and in all things proceed as in the tincture of lac.

Its Uses.

The composition of amber seems to be petroleum and an acid; 'tis neither alkaline nor acid; 'tis bitter and aromatick, and somewhat astringent: In winter the tincture deposits a resinous matter, which heat dissolves; it totally almost dissolves in spirit of wine; 'tis a good antihysterick, good in cold and watry diseases; 'tis antiepileptic and anticonvulsive; the tincture has more virtues in it than the amber itself (a).

(a) *Quid potest dare, quod non habet?*

P R O-

PROCESS LIX.

Tincture of benjamin by 47, 48, 49.

PREPARATION.

Take benjamin, powder it, pour on spirit of wine, boil them, repeat this once or twice, and the tincture is made.

Its Uses.

If this be put into water it grows milky, and is fit for washing the face, as barbers know.

PROCESS LX.

Tincture of guaiacum by 47, 48, 49.

PREPARATION.

Take guaiacum in powder or its bark, pour on spirit of wine in a chymical glass with a long neck, boil them together; this you may repeat as often as it affords a tincture; strain the tincture from the fœces, distill off the spirit of wine to one 4th, if the spirit of wine should be watry, the resin will subside.

Its Use.

This and other tinctures of resinous bodies serve to make resins; sanders, rhodium, and the like, may be made tinctures of after the same manner. This tincture is good to wash venereal ulcers withal.

P R O-

PROCESS LXI.

Tincture of Scammony by 47, 48, 49.

PREPARATION.

This, tythimal, euphorbium, dandelion, tragopogon, and such as afford milky juices, are all made into tinctures with spirit of wine, as in the 47th, 48th and 49th Process.

Its Uses.

It purges, to wit, ʒij with ʒj of syrup of Roses; hence it is plain, that spirit of wine dissolves its like: If a saponaceous body is to be made into tinctures, then common spirit is best, as hellebore, jalap, mechoacan, &c. so tincture of jalap with much rectified alcohol, purges not so well; so Opium is best in wine, water and common spirit will do, but not so well; alkaline salt does not always answer for some tinctures.

PROCESS LXII.

A purging potion from 61, a sudorifick from 60.

PREPARATION.

Take tincture of scammony ʒij, syrup of rheubarb (of rheubarb with succory, of roses or of anna) ʒvj: Or take tincture of jalap ʒiv, syrup of buckthorn ʒss. They will purge.

Take tincture of guaiacum ʒiv, syrup of the opening roots or mugwort ʒij, mix, it sweats, and is good in the pox, taken fasting. Tincture of sign. Colubrinum, is good in intermittents.

Its Uses.

These tinctures are apt to stick in the bowels; with water they precipitate, nor can they be taken alone; hence syrup is their best vehicle.

P R O C E S S L X I I I.

Virgins milk, from 59.

P R E P A R A T I O N.

Pour tincture of benjamin into water, and it grows milky.

Its Uses.

This shews how resins are made; the resinous particles and fleaks unite, and become resins.

P R O C E S S L X I V.

Resins from 60, 61.

P R E P A R A T I O N.

Put the tinctures of the 60th and 61st Process into water, and the water grows white and the resin falls, which may be gather'd, and the spirit may be recover'd by distillation. As soon as the resin hardens, gather it; it melts by heat, dissolves in oil or alcohol; keep it dry and shut; camphire and benjamin are natural resins. *N. B.* When pure alcohol acts on plants, its action is as if it were common brandy, because the plants are also watry.

Their Uses.

There is reason to doubt whether resins are oils thicken'd by acids. These resins are caustick and are apt to stick; hence the yolk of an egg or syrup must be us'd to dissolve them, otherwise they are apt to go down in pills undissolv'd. Oils grow resinous if they are depriv'd of the spirit or alcohol they were dissolv'd in; thus oil of cinnamon dissolv'd in alcohol, call off the spirit, and with water the oil grows resinous and white. The purgative quality resides in the resins; but also in the extract, for dissolve this extract in water, boil, you have a purgative.

P R O C E S S LXV.

Essential extracts of saffron by 48.

P R E P A R A T I O N.

The ancients call'd saffron the *aroma Philosophorum*; it contains volatile parts, and is easily corrupted.

Take *English* saffron cut small two ounces, put into a glass, pour spirit of wine upon it to six fingers height, stop the glass with a paper cone, give heat of 100° under ashes, you get yellow tincture; the saffron grows pale; pour out the alcohol and pour in more, till you get all the tincture; pour on water at last, and you make the saffron white, 'tis then a wonder where all this stinging matter lodg'd.

Distill, you get a spirit smelling of saffron, and the remainder keep, 'tis a rich tincture.

Their Uses.

This experiment shews us an oleous spirit, neither resinous, gummosc, oil, spirit, nor balsam. Its extract mixes with water, oil, and spirit; it is of such a quality, as to make those who take it laugh immoderately; it dyes the urine yellow or red; it is lithontriptick; this preparation is preferable to that of letting it corrupt in a dunghill; it has virtues not to be accounted for.

Ambergrease, mosch, civet, castor, &c. afford tinctures like this, by the same method.

Extracts may be made so as to contain the whole virtue of the drugs.

P R O C E S S LXVI.

Essential extracts of camphire by 48, 49.

P R E P A R A T I O N.

Camphire comes from *Ceylon*; they distill the root of its tree and that affords an oil, this they sublime again and it grows resinous; this mixed with spirit of wine dissolves in it, and rises with it if distill'd together, but grows milky with water, and if dissolv'd in acid spirits, it also turns milky in water.

Thus dissolv'd it is discutient and good in gales, is drying, promotes perspiration, but I fear 'tis not good in nerves that are hurt,

PROCESS LXVII.

Quintessences from 23, 30, 48, 49.

PREPARATION.

1st, Put any essential oil with 12 times its quantity of the most rectified alcohol alcaliz'd, shake them together and they make an uniform mixture clear and limpid. 2^{dly}, It appears that essential oils will mix with this rectified spirit, but if any water be join'd, it then turns white. 3^{dly}, Distill this mixture, and the oil and spirit unite the better. 4^{thly}, If you distill with a fire of 90°, the alcohol will ascend impregnated with the spirit of the oil, but not the oil itself, which remains thick at bottom.

Their Uses.

These are call'd quintessences, because there is somewhat added besides the four elements; one drop of this essence dropt into *Spanish* wine, is a great refresher of the spirits; if one drop of this mixture be put into water, it grows milky; and thus we discover oils being mixt with alcohol, alcohol then acts upon the spirits and oils of plants, and unites with 'em: These quintessences resemble fire, and being imprudently taken, or applied outwardly, they produce inflammations, and even gangrenes.

P R O C E S S LXVIII.

Dry quintessences prepar'd with sugar from 67, 65.

P R E P A R A T I O N.

First, Take alcohol dissolv'd with aromatick oil, pour on 10 times its quantity of fine sugar, mix 'em well together in a mortar, put the mixture into a purcelan vessel within a glass cucurbit moderately warm, that the remaining spirit may extract, and by putting on an alembick may be gather'd into a liquid quintessence; in the purcelan vessel the quintessence will impregnate the sugar; this also may be done with a dram of wheat flower and five drams of white sugar; the same may be done with a dram of quintessence of 67, half a dram of essential extract of 65, and three drams of sugar and as much wheat flower; there are infinite manners of making these quintessences.

Their Uses.

We see what pretty tricks we play with remedies, and collecting the virtues of 'em summarily for if a scruple of this be mixt with an ounce of *Spanish* wine, it proves a great aromatick; chymistry then affords the best of remedies; the convenience of these quintessences is that they may be carried to a distance.

P R O C E S S LXIX.

A simple aromatick spirit from the flowers of lavender.

P R E P A R A T I O N.

Take six ounces of fresh ripe lavender flowers, gather'd after mid-day in fair weather, common spirit of wine 12 pound, distill according to art till a white liquor appears; for first the clear liquor comes, which is the spirit, then the white liquor which is the water; keep both apart, at bottom the liquor is brownish black; then take three ounces of fresh flowers, pour both these liquors upon them; distill the spirit off, which is call'd the double spirit of lavender; you may, if you please, pour on two pound of water to the white water, and distill one pound from thence.

You may repeat this operation over again with the spirit and the water, and it will still be richer; the same may be said of all aromatick flowers, such as Gilliflowers, Rosemary, &c. The Queen of Hungary's water is such a spirit of Rosemary flowers.

Its Uses.

The oil mixes well enough with the spirit, but it makes the water white; the virtues of these spirits resemble the quintessences of 67, and grow milky in water as they do.

P R O C E S S LXX:

A simple aromatick spirit of the dry leaves of Mint.

P R E P A R A T I O N.

Take dry Mint leaves, pour 20 times their quantity of brandy, distill to half; this is the spirit of Mint; if you press out the remainder, add more Mint, put to them the first spirit and distill to half; repeat this a third time, and you get spirit of Mint three times cohobated.

Its Uses.

It is good in cold, sour, phlegmatick, watry, windy stomachs, to half an ounce, and in vomiting.

P R O C E S S LXXI.

A simple aromatick spirit of Rosemary, or any spices and aromatics.

P R E P A R A T I O N.

Take Rosemary-tops, fill the glass half full, pour on brandy till the vessel is two 3ds full, distill to half, and proceed in every thing as in 70; let this be done in any wooden furnace: If we distill this spirit oftner than thrice, the spirit becomes ungrateful, and smells like fresh wax.

Its Uses.

This spirit is not distinguishable from that of the flowers (Process 69.) and it has the same virtues. So is distill'd the spirit of lavender, &c.

P R O C E S S LXXII.

A compound aromatick spirit.

P R E P A R A T I O N.

The *Spiritus Rector* may be in the waters, in the oils, and in both united; I made the following for *Sal volatile oleosum*; Take orange, cinnamon, lemon, bark of each four ounces; flowers of orange, citron, lemons, lavender, red Roses, Rosemary, of each two ounces; roots of Angelica, *Florentine* orris, of each one ounce; cloves, mace, nutmegs, of each two drams; rectified spirit of wine, 15 pound; distill according to art, so long as clear spirit comes over, which keep apart; then distill two pound of the white water, which call an aromatick water. Take fresh ingredients, and distill a second time, as in Process 70, &c. when you repeat the operation another time, hang Ambergrease in the beak of the cucurbit. My wooden furnace may be us'd, or a retort, with a slow fire.

Its Uses.

See Process 69, 70, 71, and we learn the use of this spirit; they recruit our spirits in old age, but their effect soon vanishes, so that the first dram soon demands a second.

P R O-

P R O C E S S LXXIII.

Soap made of express'd oils and a fix'd alcali (13.)

P R E P A R A T I O N.

Take equal quantities of oil olives and oil of Tartar, mix them, they grow milky, but in time they part, and the oil Olive swims; the reason of their union is the acid of the Olive oil, for oils without acid unite not so well: Boil these gently together till the water in each of them flies off, and this is *soap*. The stronger is the alcali, the better is the soap; hence lime is most in use, whose quantity use has taught; they take the alkaline salt of Process 13; they boil it in water till the liquor bears an egg; then they take part of this *Mistress as they call it*, and dilute it with more water, until an egg will fall to the bottom; they take the fresh oil and mix it with this weaker lye; they boil these together, stirring, till they begin to unite together, then they pour on the stronger, or mistress, three parts to one share of oil, and boil, till a drop on a stone hardens, and try'd with water lathers, for if any oil appears on the stone or in the water, they add more of the strong lye; if it taste too acrimonious, they add more oil and boil on, till by trial it will cut when cool'd. In the place of oil Olives, any fats of fishes or animals will do; and whale oil serves for black soap; and the purer the alcali and oil are, the better is the soap.

The Uses.

We learn from hence how oils and fixt salts will unite; oil by alcali loses its nature; where oils abound in us, salts are wanting; hence then fixt
salts

salts are good; oils we see obtund alcali's, and are therefore good in acrimonious blood, as appears in acute cases, scurvy, pains of the kidneys or bladder; salts dissolve gums and gummoses bodies and coagulations, they deterge as soap does; they disengage adhesions and prevent strong concretions; it is anti-acid, and dissolves humours; in ulcers it is good to inject; it may be ting'd with saffron, turmeric, cochineal; its nauseous smell may be abated with any balsam of *Peru*, &c. but its use is bad in putrefactive diseases, as plague, &c. it does what water or oil can't; it is better than alcali alone.

PROCESS LXXIV.

Soap from distill'd oil and a fixt alcali (12.)

PREPARATION.

This has been much desir'd heretofore; 'tis done thus, pour upon hot and scalding fixt salt, the æthereal oil of turpentine drop by drop, stirring well, till you have pour'd on enough; put it then into an urinal and cover it, and place it in a cellar. The salt that rises up into the urinal is not volatile, as I try'd by subliming, for nothing ascended.

Its Uses.

It is saponaceous, and acts, but more powerfully, as the former. This is *Matthew's* soap for *Pilule Mathæi* or *Starkeianæ*. It is chang'd with acids; it makes with alcohol the *Elixir parvum sapientum*.

PRO-

PROCESS LXXV.

Tartar tartaris'd.

PREPARATION.

Take tartar, powder it, boil it in water till it is clear; whilst it boils pour in oil of tartar gradually, thus continue to do so long as there is any ebullition rais'd by pouring in the oil; then take it off the fire, strain it, then evaporate, and you get this *Tartarus Tartarizatus* or *Solubilis*.

Its Uses.

Thus you get tartar soluble in water, neither acid nor alcali, but a neutral salt; tartar, which is a stone, and very hardly soluble in water, by pouring in the oil of tartar they make a new kind of salt which is purgative, and may be the *Samech* of *Paracelsus*; 'tis an excellent remedy for the dissolution of viscous parts, as appears by its dissolving lacca and myrrh, it expels the viscous matter by urine; 'tis good in the stone, jaundice, and spleen; and when cream of tartar is taken inwardly, the salt of the bile joins in with it, and makes it a salt like this.

PROCESS LXXVI.

Tartar regenerated.

PREPARATION.

Pour on to a strong fixt salt, distill'd vinegar, so as to cover it; at first there is no fermentation, but by concussion a great one arises, which is very strong and lasts a long time; the salt requires

quires 14 times its weight of the spirit; when we have sated the salt so that they effervesce no more, then this is a new salt, which is diuretick, diaphoretick, and purgative, and which attenuates, given in a proper dose; distill this and you get a pure water, there remains at bottom a penetrating liquor; if to this remainder we pour on more spirit and they should effervesce, we must saturate the salt till it ceases fermenting, then we evaporate till all is dry, and this is call'd regenerated tartar.

Homborg found that the alcali was one 29th of the acid, and that the water was 36 of the whole: If we encrease the fire to any great degree, it flies off, but by a gentle fire it turns into a mass that will cut like chalk; in the cold it appears in this form, but with heat it runs like oil.

Its Uses.

By this we observe the following particulars; that this acid and alcali effervesce; that they melt into oil by the fire because they flame; by distillation they afford an oil, and they appear like oil on the fire; that a new salt is generated by the mixture of alcali and acid; that we can ascertain what acid and what water is in vinegar; how to convert a strong alcali into a saponaceous body; how to obtain an excellent menstruum; how to gain a remedy that profits cold distempers, and hurts not hot ones; is not this the *Sal Tartari volatilis* of *Helmont*, which was a succedaneum for an alcaest? is not this the *Acetum radicum* of the chymists? if you dry it too much it will fly off.

PROCESS LXXVII.

A tincture of tartar tartarised.

PREPARATION.

Take tartar tartaris'd reduced into fine powder; pour on alcohol to four inches height, put 'em into a viol stoppt with paper; let 'em boil gently for the space of a night and a day; the alcohol will turn of a golden colour, a fine aromack, tart, penetrating and warm; you may repeat this with new alcohol, and there will be a fine salt at bottom.

Its Uses.

This shews how much of this salt will be dissolv'd in alcohol; 'tis warming, cleansing in ulcers, and consolidating in wounds, and the salt at bottom is white.

PROCESS LXXVIII.

A solution of tartar regenerated in alcohol.

PREPARATION.

Pour on to tartar regenerated six times its quantity of alcohol, boil it gently in our wooden furnace and 'twill be an equal composition, the dregs subsiding; decant the liquor, if any salt is undissolv'd, proceed as now said with more alcohol, decant; then distill to half, and you have the tincture.

Its

Its Uses,

Here's an union of alcali, acid, and an oily spirit, free from earth and any dangerous acrimony; this is the *Elixir parvum sapientum*, which is very penetrating and diaphoretick, a great dissolver, is good in wounds, ulcers and tumors; 'tis easily prepar'd by mixing pot-ashes with 15 times its quantity of vinegar; then strain and inspissate. *Pliny* knew this, when he commanded the ashes of vine-twigs to be mix'd with vinegar against the spleen diseases.

P R O C E S S LXXIX.

Harvey's *tincture of salt of tartar.*

P R E P A R A T I O N.

Take black tartar of the 55th Process, powder it in a hot iron mortar, put it into a glass viol, pour in common brandy to four fingers height above it, boil it for 24 hours gently in our wooden furnace, and you have a black, thin, bitter, aromatick, lixivial liquor, pour it out clear; this is a good menstruum, consisting of water, acid, alcali, and alcohol; it dissolves vegetables, is good to deterge and dry humid and virulent ulcers; it consumes luxuriant flesh if mix'd with a little oil; 'tis good in phlegmatick watry, acid, and terrestrial diseases; it opens obstructions, therefore is good in anasarca's, green-sickness, jaundice, cold gouts; 'tis diaphoretick, diuretick, and laxative: Take two or three drams of it, an ounce of the syrup of opening roots well diluted with fennel-water, take it in a morning three or four times; but 'tis bad where putrid diseases reign. See *Gideon Harvey* and *Dioscorides*.

P R O-

P R O C E S S LXXX.

Helmont's tincture of salt of tartar.

P R E P A R A T I O N.

Take pure salt of tartar, as in Process the 12th, then put it into a viol with a broad mouth in which is contain'd pure alcohol and hot, let the neck of the viol be warm, pour the salt of tartar into it hot from the fire thro' a paper funnel, which will make it boil, stop the viol with cork; pour afterwards, when all is cool, more alcohol, till the viol be three quarters full, shake the gls that nothing of the salt stick to the neck, for this moistening would spoil the operation; put 'em in 100° of heat gently stop'd, and you will have a fine red tincture, which will be, if the liquor be inspissated by distilling, very saponaceous. *N.B.* If any air gets in, you can never get this tincture; hence these rules given must be strictly observ'd.

Its Uses.

Hence appears how salt of tartar attracts water, acid, and oils; hence appears a new manner of getting soap, as you may find by exsiccation of this tincture; it does not effervesce evidently with acids, nor so readily precipitate any thing dissolv'd in acids; the soap we get from it by distilling off the alcohol is a blackish red; it dissolves distill'd oils presently; it makes a tincture from lac, myrrh, and amber; 'tis good in acid diseases, it must be diluted in water to be given internally; it appears that spirit of wine distill'd from salt of tartar is half water. I have found, that the tincture of salt of tartar digested for a great many months with alcali, and laid aside for four years, the salt
was

was dry at bottom, and the tincture red at top; then inverting the glass, and pouring out the tincture and salt into a glass cucurbit, they were very fragrant; I distill'd this alcohol, which was limpid and fragrant, but the salt at bottom was red, which before was white: I pour'd this alcohol again upon the salt, which did not distill so freely; this alcohol was fiery, and the salt at bottom was blackish red; I repeated this distillation for 21 times, the salt at bottom was black, and the alcohol most acrid; I encreas'd the fire to a great degree upon a sand heat, water came out, but no alcohol; hence it appear'd that the salt and alcohol contain'd water, but not to half the quantity of alcohol; and I am apt to believe the air produc'd this water: I have also found, that this salt would never turn volatile, tho' I have distill'd 22 times (b). This salt expos'd, run into a very acrimonious brown liquor; this experiment I tried to know the quantity of water in alcohol, and whether a volatile salt could be got from tartar with alcohol. How rich are people made by promises!

PROCESS LXXXI.

Elixir proprietatis with spirit of vinegar.

PREPARATION.

Take choice aloes, saffron, myrrh, half an ounce, being bruis'd and cut small, pour on 20 times their quantity of spirit of vinegar, boil for 12 hours in

(b) Pray what is it that makes the spirit of wine so fiery, but the salt of tartar? Is not then some part of the salt of tartar in this cohobated alcohol? Therefore this acrimony is part of the tartar turn'd volatile, which we can prove by collateral proofs.

90 *The Elements of* CHYMISTRY.

a high-neck'd glass, let them cool and settle, decant; pour on more spirit, boil and decant as before, distill, inspissate to one third.

Its Uses.

I take this spirit to be better than oil of sulphur, because it hardens the gums, and hinders them from uniting with the alcohol; it is good in ulcers any where, and internally is good in phlegm, and worms; it purges, sweats, and promotes urine; it is given in a morning from one to two drams; it answers *Rufus's* pills which are good against the plague.

P R O C E S S LXXXII.

Elixir proprietatis with distill'd water, or any aromatick water.

P R E P A R A T I O N.

Take aloes, saffron, and myrrh, q. p. powder them, pour upon them in a bolt-head 20 times their weight of scurvy-grass-water, prepare as before.

Its Uses.

This always breeds a mother; it is good as in the former preparation.

P R O C E S S LXXXIII.

Elixir proprietatis with a fixt alcali (12.)

P R E P A R A T I O N.

Take the aforesaid ingredients bruis'd, put to them oil of tartar, digest in a bolt-head; pour on any

any aromattick water, or alcohol once or more rectified, or aromattick spirits, which you may repeat till all the tincture is drawn out; boil, decant, and distill, till you have a thick liquor like oil.

Its Uses.

It is good in all acid cases, watry, phlegmatick, cold, scirrhus and cold obstructions; it is a nerve medicine, emmenagogue, antihelminthick, antiscorbutick, appetising, supplies bile, and breeds milk.

P R O C E S S LXXXIV.

Elixir proprietatis with tartar tartaris'd.

P R E P A R A T I O N.

To the same species, pour on tartar tartaris'd to thrice the weight of the ingredients, in a bolt-head, digest for three days in 150° of heat; the species dissolve into pap, better than with the above-nam'd liquors, then pour on 20 times the quantity of alcohol, boil for 12 hours gently, let them cool, then decant; repeat this work till all the tincture is drawn off, then inspissate with a gentle fire to the thickness of oil.

Its Uses.

This is better than all the preceding; it is deobstructive, good in chronical, acid cases, nor does it injure alkaline diseases.

P R O C E S S LXXXV.

Elixir proprietatis with tartar regenerated.

P R E P A R A T I O N.

To the aforesaid species pour on thrice as much of the liquor of this tartar regenerated, all will be dissolv'd; then pour on alcohol 20 times as much as the weight of them, boil 12 hours gently, and do as above; inspissate to half, the alcohol serves again; the elixir is thick and turbid.

Its Uses.

It is excellent in chronical cases to dissolve the juices; it stimulates the nerves, deobstructs and dissipates tumours; this I repute *Paracelsus* and *Helmont's* elixir; we see then various dissolvents of these species, and the virtues differ according to the menstrua; with diaphoreticks, diureticks or catharticks, they sweat, promote urine or stools all, except that with water, preserve from putrefaction; they are all, except that with acids, good in caries; saffron is cordial, aloes purges, myrrh antiseptick; but in hæmorrhages, bleeding piles or in agitated humours, they hurt.

P R O C E S S LXXXVI.

The analysis of soot.

P R E P A R A T I O N.

Take the blackest baker's (wood) soot, fill glass retort, fit a large recipient, lute with linsæe paste; give a fire of 150° , a clear water ascend take this water away, clap the recipient on aga

a yellow volatile salt ascends, then a black oil; let all cool, you find in the neck of the retort a salt, and at bottom a black dreg, which at top is a *sal armoniac*; rectify the white water, you get a volatile spirit and an oily volatile salt.

Its Uses.

Thus we learn what soot is and affords by a chimney and a retort; 1. a fetid spirit, in both waters; 2. a volatile salt that is oily, as appears by its smell, taste, and effervescing with acids; 3. a volatile spirit; 4. a blackish fetid oil; 5. a *sal armoniac* which is found on the earth, which heats not with acids, and with any fixt salt affords a volatile salt; 6. an earth, which by calcining turns white. See then what flies into the air! soot made into pills gilded helps cold diseases; its *sal armoniac* is good in cancers, says *Hartman*: Soot differs according to its materials that are burnt.

P R O C E S S LXXXVII.

The analysis of amber.

P R E P A R A T I O N.

Put amber bruis'd into a glass retort with a wide neck, give a fire of 212° , a limpid oil comes over; change the recipient, lute again, there comes over a red oil; change your recipient, then comes over a salt, and a red oil; encrease the fire, a black oil ascends, thick as turpentine, and lastly a black flatulent matter, which would burst a narrow-neck'd retort; all these may be rectified; at bottom is a sort of jet.

Its Uses.

Amber is a sort of petroleum; the salt is an *acid*, that dissolves in alcohol; the oils are balsamick, diaphoretick, diuretick, emmenagogue, antihysterical; the salt antiseptical, stimulates the nerves and agitates the spirits; how does this amber differ from its parts!

P R O C E S S LXXXVIII.

The putrefaction of vegetables.

P R E P A R A T I O N.

If you put fresh herbs into a hogshhead and press them down, the harder the better, they begin to heat, and putrefy and smell, and if distill'd, they will afford water, salts that are volatile, and oils of all sorts, limpid, red, and black, and an earth at bottom, but no fixt salt, which before putrefaction they would have done; nay, Sorrel putrefied does all this, and 'tis commonly experienc'd in hay.

Its Uses.

If the bodies fall into flames, nothing is afforded; hence we see how all bodies, how different soever, even acids, &c. afford these principles by putrefaction; hence our victuals putrefy in us. This differs from fermentation in the following manner; putrefaction requires a greater compression, density, and thickness, than fermentation; it acts on all vegetables, not so fermentation; it requires a greater heat than fermentation, which requires not above 70° , except in vinegar; putrefaction makes the salts volatile, and the oils fetid, and almost the earth too; whereas fermentation makes

makes the acids volatile, and the alcali's fixt, the oils fragrant, makes an acid tartar; this then makes volatiles, and fermentation fixt ones, and acids, compounded of oil, acid, spirit, and earth; this makes a simple volatile alcali, and fermentation turns the saline into an acid, and the remainder into a saline that is fixt: They then who think there is no difference between these two actions, I shall not dispute with them; putrefaction in short, by a greater fire or heat, moves the air, and expels all things in a short space; whereas fermentation by a smaller heat gradually attenuates, and moves the inflammable spirits, or fires them: I only speak of the putrefaction of vegetables, and here I finish my demonstration on vegetables, where they are turn'd into the shape of animal humours. *Vid. D. Cox Phil. Transf. N^o. 100. p. 7002. N^o. 101. p. 4. (c).*

(c) There certainly is a gradual difference between these two motions; *the oils* by fermentation are more attenuated, but by putrefaction less; and the salts are more mov'd by putrefaction than the oils: So that altho' both be intestine motions, yet fermentation is a struggle made principally between the oils and detach'd acids; and putrefaction is caus'd by a mutual attraction between the salts; how or why there should be this difference, I shall briefly remark.

And it appears that fermentation is made between the detach'd acids and oils, that are loose, but that putrefaction is rais'd among those parts that are hardest to dissolve; for after fermentation is over, the remaining dregs left to putrefy do afford volatile salts and oils.

And moreover, where is the difficulty of assenting to the ancient way of talking, where *fermentation* being taken, and very justly, for a general term, is divided into a *perfective* and a *corruptive* one? by the first we have winy liquors, and by the latter volatile salts and oils: But for want of somewhat momentous, men often dispute on trifles.

The Second Part of the Chymical
Operations upon ANIMALS.

P R E F A C E.

'Tis evident from the 88th or last Process, that plants will turn volatile and alcalious, and that the oils will putrefy, let them be of what kind soever, as animal juices do; hence, 1st, All things in animals are chang'd and fly off, so that they are not the same to day and to morrow; our nails, and broken bones, being repair'd, our hairs falling off, and our secretions continually going on, convince us of this truth. 2^{dly}, As the egg of a pullet grows heavier by hatching, as the body of a child grows up to that of a man, so what flies off is repair'd daily. 3^{dly}, Our aliments are taken principally from vegetables and animals, and from some fossils or salts, &c. and the *Brachmans* and the *Pythagoreans* live long by vegetables and water. 4^{thly}, Most animals we feed on live upon vegetables, the larger fishes devour the less, or insects, and some birds live upon animal prey, yet most of 'em live upon vegetables; 5^{thly}, wherefore a human body lives mostly and secondarily upon vegetables: 6^{thly}, A chymist therefore ought to know the nature of vegetables. 7^{thly}, We now must observe how vegetables lose their natural condition, and turn by the actions of a human body into putrefaction; and having seriously consider'd what ought first to be treated on, I have chose milk for my subject. 8^{thly}, Milk is the proper nourishment of man, for all we receive turns into chyle or milk; from this are nourish'd all the parts of the body, from this are supplied all the secretions; in the stomach, indeed, there are signs of fermentation

fermentation and putrefaction; the chyle is a sort of emulsion, the victuals being ground by the teeth as in a mortar, and diluted with the juices every where, as well as press'd by the stomach and muscles of the abdomen into a milk which has cream: The best is human milk, next to that asses, then mares, goats and cows milk; 'tis good in atrophias; the runnet coagulates this milk, and turns it into a caseous and serous matter; if it be put upon the fire, it turns into butter and cheese; this is a middle liquor betwixt serum and an emulsion; and the chyle differs according to the nature of the aliments we feed on.

PROCESS LXXXIX.

New cows milk is not sour, has no alcali, is scarcely salt, and has no spirit (45, 49.)

PREPARATION.

1st, The taste, the smell, and dropping it into the eye, produce no troublesome sensation. 2^{dly}, Heating it, and adding a volatile or fixt alcali, no effervescence ensues, only disturb the liquor, and inspissate it a little. 3^{dly}, By pouring in spirit of vinegar, or any other acid spirit, there ensues no effervescence, only a coagulation. 4^{thly}, Oil of tartar pour'd on to milk coagulated with oil of vitriol, there ensues a most violent effervescence, greater than if pure alcali and oil of vitriol had been mixt together. 5^{thly}, New milk put into a glass cucurbit and distill'd by 160° of heat, there first ascends a watry liquor that neither effervesces with alcali or acid; this water neither tastes, smells, nor feels to the naked eye any way biting, but is rather fatty and sweetish, and has no saltishness in it.

Its

Its Uses.

Behold, my most desirable hearers, the nature of milk examin'd chymically, nothing appears of fermentation or putrefaction, hence cannot we account chymically for chylicification; however, as milk changes in 12 hours, so if long retain'd in us it begins to corrupt. This experiment was made on cows milk; there are, however, some who affirm there is a latent acid in milk, they must therefore affirm this from the effects produc'd on our senses, for there's no such thing appears chymically (*d*).

P R O C E S S X C.

New cows milk is coagulated with acids, even whilst a boiling.

P R E P A R A T I O N.

Pour on vinegar, spirits of nitre, or salt or oil of vitriol, the milk turns into curds and whey; the curds are cheese, which is hard, and frames our solids, and burns and smells.

Its Uses.

Hence, as the milk curdles and keeps still white, it becomes obstructive, and acid diseases make people pale-colour'd, belch and sweat sour.

(*d*) There are so many reasons to convince us that milk contains acid, that the professor must either be weak himself, or deems the world to be such: For in the first place, effervescence is not always necessary for the discovery of an acid, or we should find no silent precipitations; moreover, what is that perturbation and inspissation that ensues upon pouring in a volatile and fixt alkali, spoke of in the 2d paragraph of this Process, but the effect of an alkali and an acid.

P R O-

P R O C E S S XCI.

New cows milk put upon the fire and boiling with a fixt alcali, coagulates, grows yellow and red.

P R E P A R A T I O N.

To milk boiling diluted with a little water, pour in drop by drop oil of tartar; it grows yellowish and then red, and by degrees it coagulates.

Its Uses.

Hence we see how alcali's turn the milk into blood; so it is that the milk of nurses in fevers is yellow, tastes saltish, and coagulates in their breasts; not from the acid, but from the too great heat evaporating the fluids; hence coagulations in fevers are not always from acids; hence in the last plague among the cattle, the cows milk was yellow and fetid, and their stomachs were dried up with heat; hence it appears that the whiteness of the milk depends upon some acid in the blood, and such persons are always pale, and are to be restor'd by alcalious medicines; hence the colour depends upon the nature of the blood; it does not always happen that alcali's will dissolve coagulations occasion'd by acids.

P R O C E S S XCII.

The urine is not acid, nor alkaline, but 'tis fetid.

P R E P A R A T I O N.

Take the urine of a sound person twelve hours after their eating or drinking, mix with it oil of Tartar or spirit of salt armoniack, it does not effervesce,

fervesce, neither does it fall into any heat with acid spirits, after it has staid twelve hours in the body 'tis thoroughly digested ; neither does it effervesce altho' the person drinks *Rhenish*, uses a great quantity of vinegar, and lives upon acid plants ; neither does it turn the juices of herbs green as alcali's do.

Its Uses.

Hence it appears, that the salts of the urine are neither acid nor alkaline : I have tried the urine of a person which had been suppress'd for five or six days, yet could find no sign of an alcali in it ; but another person whose urine had been retain'd from a stone in the bladder, when extracted, struck the surgeon with its putrefied smell so much, that he was ill for some days ; hence false chymistry, that has cry'd aloud there are alkaline salts in the blood of sound persons, is now set right, and that there is only a sort of sea-salt in the urine which makes it bitter and ungratefully salt.

(e) We shall presently see in the 95th and 97th Process, how this gentleman will contradict himself ; 'tis therefore not a sea-salt but an armoniacal one, where by mixing a fixt alcali along with it, and calling it off, we get a volatile spirit and an acid ; but sea-salt does not contain a volatile salt.

PROCESS XCIII.

Fresh urine distilling from vessels close shut affords a fetid, nauseous water, not alkaline, not acid, not saline, nor spirituous as wines.

PREPARATION.

Take the urine of a sound man, boil it and then distill it with 150° of heat, until the 20th part remains at bottom, and you have limpid water that in the still grows redder as you distill more off, till at last it becomes thick and blackish red, this limpid water is fetid, but has no volatile alkaline smell, which smell it retains if repeatedly distill'd or expos'd to the air, nor is it abolish'd by pouring on an acid; it has the smell of a new dead body, the taste of it ungrateful and nauseous, but not alkaline; when distill'd it has not those streaks which the winy spirits have, it extinguishes flame, nor is it spirituous, though distill'd from persons drinking strong liquors, it does not effervesce with acids, nor change the colour of blue plants into green, it did not much precipitate bodies which acids had dissolv'd, it never shew'd any sign of salt, whether acid, alkaline or neutral.

Its Uses.

Hence it appears to be some volatile oil, that is light and mixes with the water, and can't be separated from it; it seems to be like the *perspirabile*. The fermented spirits of vegetables do not pass by urine, they may perhaps pass through the pores; hence we know there is no volatile salt in the blood whilst 'tis no hotter than boiling water; let others think what they please, there is nothing

thing of a volatile acid in it, how much then is physick to be alter'd; this foetor encreases with the blood's motion, 'tis therefore nothing but oil (*f*).

P R O C E S S X C I V.

The urine remaining after the last Process is neither acid nor alcali, but saltish, fetid, altho' not saponaceous.

P R E P A R A T I O N.

If we mix acids or alcali's with this remainder, there is no sign of an effervescence, but it has an acrimonious bitterish taste and smells strong, nor does it cleanse woollen clothes as alcali's will do: Till it putrefies, it has nothing chylous nor lymphatick in it, neither any thing caseous, but the more we inspissate it by fire, it tastes more acrimonious and is deeper colour'd, as appears in acute diseases.

Its Uses.

Therefore there's no volatile alcali in a sound person, nor any acid; 'tis therefore a peculiar salt of itself; it contains nothing nutritious, therefore no such parts are voided along with it, therefore 'tis excrementitious; hence the thickness of

(*f*) This author still proceeds upon a mistaken Notion. He supposes that there is no alcali in the blood, unless there be an effervescence; but a silent precipitation of bodies dissolv'd in acids is a sufficient proof of the presence of an alcali, and as he tells us, *non præcipitabat multum quæ in acido soluta fuerunt*. This is a Proof there is some alcali in this water; and as the precipitation was not great, then the quantity of salt was but small, but *ipso facto*, as he owns it a light volatile oil, it therefore partakes of a volatile salt.

the

the urine, its small quantity, its high colour, and its acrimony, from whence diseases are produc'd, shew a necessity for water to dilute.

PROCESS XCV.

The same urine inspissated to a 40th part and then distill'd, being mixt with sand, gives out an alkaline volatile salt, a most fetid oil, and saline dregs.

PREPARATION.

Distill or evaporate 40 pound of urine to one, to this one remaining part add three parts of sand; distill in a sand heat by a gentle fire, often removing the recipients; first comes up a limpid water as before, next a limpid alkaline liquor; then lute your recipient and encrease your fire, then come up white clouds, fatty streaks, an oleous liquor, and an alkaline salt, then a yellow oil, the fire being encreas'd to the last degree, and there remain the dregs saltish at bottom; the first water is scarce alkaline, the second is very much so, effervesces with acids, and makes a neutral salt like salt armoniac, and is truly a volatile alcali; the next is an oleous alkaline, the last oil is intolerably fetid, and the dregs are a sea-salt.

Its Uses.

Hence the salts of the urine are made volatile by a certain degree of fire; this urinous salt is not armoniacal, for salt armoniac being made volatile by a certain degree of heat, yet being sublim'd, is never alkaline, but a mixt salt; whereas the salt of urine is truly alkaline, it approaches to the nature of an alcali and armoniac salt, and yet is neither of 'em; it appears that the salt, the
saline

saline spirit, and the first oil, are equally volatile in the sound state; it appears also that this fat spirit is water, oil, and salt, by analysis: Hence do we see the force of nature, which is gentle, changes all into acid, fetid, &c. hence we see there is no fixt salt in our humours, for I never could find any in urine, only there is a sea-salt in it: This is *Helmont's* experiment, and 'tis of great use in physick (g).

P R O C E S S XCVI.

Fresh urine inspissated distill'd with a fixt alkali.

P R E P A R A T I O N.

Fresh urine being inspissated as before, pour on oil of tartar or pot-ashes an equal quantity, and a volatile vapour arises immediately, as soon as it grows warm, as if the urine had been putrefied; distill from an alembick and there ascends a clear liquor, which in every respect is alkaline; if instead of the oil you put salt of tartar, you then get a volatile salt at the first distillation; rectify this alkaline liquor in a high cucurbit, the first part is white and alkaline, the alkali keeps the oil at bottom, but encrease the fire and it rises.

Its Uses.

From this experiment we see the urinous salts are chang'd into alkali's; hence it is known that fixt alkali's change our salts into volatiles in an instant, as if it had been done by putrefaction, and

(g) We are now come to that Process where it fairly appears there are volatile salts in our urine; in the urine there are a great many tenacious parts, and from hence a great force of fire is requir'd to drive 'em up, so 'tis in hartshorn and some other bodies.

you

you may rectify 'em as you do Hartshorn; they effervesce with acids, hence we see a great mutability of our salts into various species; (b) in ardent fevers *Hippocrates* advises acids, fixt salts are dangerous in such cases; acids change them, and correct their acrimony and fix them, lest they should fly off.

P R O C E S S XCVII.

Quick lime being mixt with fresh urine inspissated, gives a fiery but not an alkaline spirit.

P R E P A R A T I O N.

To very fresh urine throw in quick lime, in an instant a fiery spirit strikes your nostrils; join the retort and recipient, give a gentle fire and distill, you have limpid liquor intolerably fiery hot and volatile; but if you inspissate the urine to a 40th part, and add equal parts of quick lime, you get a spirit inimitably strong; this last spirit will never prove a salt by rectification; this spirit does not effervesce with acids, but its heat is diminished by 'em: As soon as you mix the lime there is a great effervescence, and if you hold your head over it, it will endanger your lungs; if this last spirit is applied to the skin, it will gangrene it; it flies off immediately in the air.

(b) From the same way of reasoning may it be infer'd, that salt of tartar mixt with salt armoniac, or with cheese, does instantly change the salts in them into volatile ones; whereas the truth of it is, that the acid in these two bodies and the fixt salt do only attract each other more strongly than the volatile did the acid, and not change any thing; therefore the volatile is not made, but in an instant set free, which plainly proves a pre-existence of that salt in the bodies.

Its Uses.

Hence lime mixt with our humours, join'd with a little heat, produces fatal disorders; the more acid and phlegmatick are our humours, the more good will prudent giving of it do. The lixivium of lime does good in muriatick diseases; hence in a cold scurvy it is useful, but in a hot one 'tis hurtful; hence have the *Germans* succeeded with the lime water, whilst the *French* are hurt by it; the stronger the lime, the stronger the lixivium; hence first, the corrosion of lime depends upon its making our salts fiery; hence in acid, watry, phlegmatick diseases, in slow circulations, and where a stimulus is wanting, these salts are good, but in alcalious and hot bloods, bad; hence mild humours may be made fiery and poisonous in an instant; hence an acid may be made most acrimonious, and yet be neither a salt, spirit, nor an oil; hence this spirit, tho' not alkaline, is stronger than any alcali, and affects our taste and smell more violently.

P R O C E S S XCVIII.

The natural salt of urine.

P R E P A R A T I O N.

Take fresh urine of the last digestion, give 200 degrees of heat, and exhale it to a thickness, strain it thus hot, put it into a cylindrical glass, cover it with paper, let it stand for a year in a cellar, and a brown clearish salt gathers at bottom, a fattish substance swims at top; take out this salt, pour cold water upon it, and clean it and keep it; if you dissolve it in warm water and exhale to a pellicule, it concretes into crystals like sugar; it neither smells, nor is alkaline.

Its Uses.

This is a sort of sea-salt, but not only so, 'tis diuretick in water, and diaphoretick, the thick matter remaining is proper to produce the phosphorus; the salts by this method do not grow alkaline: May not this salt be good in the stone?

P R O C E S S XCIX.

Milk digested affords a cream and grows sour.

P R E P A R A T I O N.

Set new milk aside and 'twill afford a cream which is soft, not acid nor alcali, which you may take off and repeat the operation; the milk remaining is call'd skimm'd, or blue milk; this cream is balsamick, lenient, good in consumptions, nephritick cases, and the gout, good in ulcers and wounds; if you put this liquor in 60° of heat, cream and milk both sour, and cream itself grows sour in this manner sooner in summer than winter, sooner in the milk of those fed with grass than dry hay, &c. and if the animals are of a hot nature, have been much exercis'd, or have fed upon alcalious plants, the milk then grows alkaline, and children sucking such milk, which is generally yellow, grow sick.

Its Use.

Hence milk contains a great deal of oil, which easily parts otherwise than in soap; it easily divides from the watry part and runs into the fatty cells; it easily turns acid; it easily also turns bitter and rancid by great heat; hence will it produce either alkaline or acid diseases, as it is managed.

P R O C E S S C.

The urine digested turns alkaline, and changes its colour, smell, taste, and properties.

P R E P A R A T I O N.

The urine being digested in a heat of 33° , will turn putrid, higher colour'd, and alkaline, and prove of use for fullers and diers, to cleanse their wools or silks as alkalines do, and will effervesce with acids; hence do physicians learn the condition of our humours by the colour of the water we learn from hence, that if the urine be retain'd it may produce dangerous disorders; we learn also, that our humours do not ferment but putrefy hence we see the use of water and acids in warm countries, and to correct hot bloods; hence in burning fevers ptisans and oxymel are good; the stone is produc'd from putrid urine; hence alkalines are good to hinder the production of the stone. I have, with amazement, seen urine set by to putrefy, and have gather'd a strong crust from the vessel it was put in; a heat of 80° will putrefy bodies, but sound chymistry shews us what diet, &c. will prevent putrefaction, which if could not be done, people in ardent fevers must die.

PROCESS CL.

Urine digested and distill'd affords alkaline spirits, a fetid oil, a volatile oily alkaline salt, a phosphorus and a sea-salt.

PREPARATION.

Take urine digested, as in the last process, distill in a glass cucurbit with a gentle fire; 1st, comes fatty *Striæ*, change your recipient; distill on, comes water over; mixt with a yellow oil, fetid, and salt, burn the black remainder, and you get a sal marine.

The water effervesces with alcali's, and rectified in a high glass, gives salt that is alkaline, and the water at bottom is fetid; distill on, it affords a volatile spirit, and *Helmont's* lithontripectick water.

There is no fixt salt to be found, 'tis only a marine one.

When I want a large quantity of volatile salt, I take 100 lb of urine, I inspissate to the consistence of honey, I expose this for some months to putrefy, then I distill from an iron pot, which has an earthen alembick and fit a large receiver, I give a fire gradually, I get a white volatile salt, and by encreasing the fire, a yellow oil, then an oil and salt, take the receiver off and keep them apart; mix what rests at bottom with two or three parts more of charcoal, and encrease the fire, and the phosphorus mounts and falls into the water like wax, and keeps for 20 years there.

Boyle, Act. Lips. 1683. Homberg 1692. p. 520.

Hoffm. 336. And from the fœces burnt, we get

a sea-salt, as appears, because it being mix'd with *aqua fortis*, dissolves gold (b).

Its Uses.

Putrefaction makes the salts and oils more acrid and fetid; we find no inflammable spirit, no acid, or fixt salt here, but all volatile; and a sea-salt; and an acid from the drugs and the phosphorus has an acid in it, when dissolv'd in the air, whence this acid? I know not. *Homburg Act. R. Sc.* 1706. p.340. *Memoires de Math. & Phys.* 1692. p.80. This acid is like oil of vitriol, is there any alum added in getting it? for we don't find it in birds dung fed with vegetables. (i).

Rectify the spirit, it becomes very limpid, and kept, has earth at bottom, that dissolves by more spirit. Alkali's breed the stone, sea-salt is good against it and putrefaction; vinegar, sulphur and sea-salt, which put in wine are *Hippocrates's* antipestiferential remedies.

P R O C E S S CII.

The origin of salt armoniac.

P R E P A R A T I O N.

It comes from *Egypt*, it tastes like salt, has no smell, it flows in the air, it has long streaks, pellucid in the middle, &c. I have made it of soot, and 'tis made of urines inspissated, 10 p. sea-salt, 2 p. wood

(b) This is no *Criterion* to prove this a sea-salt, for it may as well be a *salt armoniac* or *sal gemm.*

(i) Observe how this author is forc'd to acknowledge an acid in the urine at last, but knows not whence it comes, for it does not at all suit with his reasonings that preceded; and therefore he would gladly reject it.

foot 1 p. boil'd, strain'd, exhal'd, sublim'd, dissolv'd and coagulated. See *Worm.* and *Cassius.*

Its Uses.

It attenuates, opens, dissolves, stimulates, is sternutatory, diaphoretick, diuretick, antistiptick, preserves from putrefaction; dissolv'd in water and crystallis'd, these soft woolly crystals put into water in the time of dissolving, do cool Liquors immers'd; 'tis the *sal eyrenaicus*, from Camel's Piss, see *Pomet*, see *act. ac. Sci.* 1705. *Hist.* 83. 'tis an alkaline and sea-salt together.

PROCESS CIII.

Sal armoniac is neither acid nor alkaline.

PREPARATION.

Dissolve sal armoniac in thrice its quantity of water, heat it with 100° of heat, pour on any acid, there's no effervescence (except with oil of vitriol, (k) *vide* Process 106, 107.) and with a fixt salt, it does not effervesce, but a volatile smell ensues; therefore 'tis neither acid nor alkali.

Its Uses.

Hence 'tis a semivolatile sea-salt, for with *aqua fortis* it dissolves gold; it acts neither as alkali nor acid in us; it, as our humours, makes a volatile smell with fixt alkali's (l).

(k) N.B. Oil of vitriol effervesces with sea-salt specifically.

(l) Nothing is so ridiculous as for our author to affirm and deny in the manner he does, it is not this, it is not the other, 'tis both, 'tis neither, I know not what it is, are usual terms with him; and sometimes 'tis one thing, and then he thinks better, and rejects his first Thoughts.

P R O C E S S C I V.

Salt armoniac may be sublimed into flowers.

P R E P A R A T I O N.

Powder salt armoniac, dry it, put it into an alembick, fit and lute a recipient, put it into sand, cover it with sand, give a fire of 150° , you get flowers very white, and salt armoniac; let all cool, take it carefully out, at the bottom of the alembick is an useless dreg.

Its Uses.

It neither effervesces with acid nor alcali, except oil of vitriol; it is semivolatile; the flowers are not pellucid, they lift up all bodies, as sulphur and calcothar depurated in water.

P R O C E S S C V.

Sal armoniac with lime gives a fiery spirit.

P R E P A R A T I O N.

Take the flowers of sal armoniac, put them into a glass cucurbit warm'd, pour on as much powder of quick-lime, clap on the recipient suddenly, lute and distill, you get a fiery spirit, which is not alkaline; the mixture at bottom of the cucurbit is glassy, and shines like phosphorus. *Hamel. hist. ac. R. sc. p. 305, 306, 307, 308.* If you dissolve the flowers in 3 p. of water, and pour this upon lime and lute, you have a fiery spirit. The lime effervesces with the water, lute not till this heat is over. The mixture at bottom melts into sandy grains.

Its Uses.

Its steams raise a smoak with those of spirit of nitre, then they are alkaline; hence from inodorous bodies, we get odorous ones, from dry we get liquid; observe a phosphorus.

PROCESS CVI.

Sal armoniac with a fixt salt gives a spirit and salt both alkaline and volatile.

PREPARATION.

Take flowers of salt armoniac, 10 p. fixt salt, 3 p. mix them and distill from a sand-heat, you get a fine, white alkaline volatile salt, that flies off, and thro' all but glass, at bottom is a fixt salt; or mix nine ounces of water and distill, you get a salt and spirit, and the fixt salt stays in the retort.

Its Uses.

Both salt and spirit are strong and alkaline, effervescing with acids, and acid steams of spirit of nitre; the salt and spirit rectified are stronger still; the salt apply'd and a pitch plaister over it, will mortify parts, and is it then adviseable to smell at these?

PROCESS CVII.

The examinaiion of the fixt salt left from the aforesaid Process.

PREPARATION.

If you dissolve the remainder in water, inspissate and crystallise them, calcine, &c. and you have *Sylvius's*

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vius's sal febrifugus, which taken before the fit takes off agues.

Its Uses.

This is a sort of regenerated sal armoniac, for 'tis fixt sal armoniac and sea-salt.

P R O C E S S C V I I I.

A salt spirit from spirit or salt of sal armoniac and spirit of vinegar.

P R E P A R A T I O N.

Pour on spirit of vinegar to the spirit or salt of sal armoniac, till the effervescence ceases.

Its Uses.

It is a natural salt, good against putrefaction, aperient, diaphoretick, diuretick; it is a discutient externally, especially in diseases of the eyes.

P R O C E S S C I X.

The white of eggs is neither acid, alcali, nor has it a vinous spirit.

P R E P A R A T I O N.

We in 90° of fire pour on acids, we also pour on alcali's fixt and volatile, no effervescence ensues; mix these two together, and then they effervesce and swell largely, but return to their pristine bulk; distill with a fire of 100°, there is no spirit in the whites; it neither affects their eyes, taste, nor touch.

Its

Their Uses.

'Tis not acid nor alkaline, with 90° of heat it hatches; 'tis like the vitreous humour of our eyes, inclos'd in cells; it is soft and smooth, and viscous.

P R O C E S S C X.

The white hardens by the heat of boiling water.

P R E P A R A T I O N.

With 80° of heat it putrefies; with 160° it hardens in water, and taken out of it sweats, and dissolves Myrrh and some other things.

Its Uses.

It is hard to say what fire does, a small heat dissolves, a great one coagulates, but a greater, 224° , dissolves what 212° had coagulated.

P R O C E S S C X I.

An experiment with alcohol and the white of an egg.

P R E P A R A T I O N.

Alcohol, cold or hot, coagulates the white of an egg.

Its Use.

Wine mixes with it, but alcohol coagulates it, altho' alcohol blended with water does not.

P R O-

P R O C E S S CXII.

By distillation the white of an egg is dissolv'd,

P R E P A R A T I O N.

Distill hard eggs in the heat of boiling water, you get an insipid water, neither acid nor alkaline, but soft; the whites at bottom are golden-colour'd and transparent, and shrunk; then put them into a glass retort, give fire gradually to the last degree, you get an alkaline spirit, a volatile salt and oil, and earth at bottom; rectify, you get a volatile salt, an oil, and a fetid water; the earth affords but little salt.

Their Uses.

Volatile salts are lighter than water. How comes it then that a volatile salt is produc'd from these whites, it was not such in them? see what the fire does! re-unite these, you never re-produce whites again; How different are these things from what chymists affirm of their principles?

P R O C E S S CXIII.

A fresh white of an egg putrefies.

P R E P A R A T I O N.

In 70° of heat they rot, and afford a volatile salt, when they are rotted, they huff with acids.

Their Use,

Remark how the whites, when rotten, raise vomitings, &c. here is volatile made out of no volatile, a fetid oil from a smooth substance; by 90° of heat it hatches and nourishes.

P R O

PROCESS CXIV.

Serum is neither acid nor alcali.

PREPARATION.

Blood let out turns into cake and water; mix any acid, no effervescence ensues; mix volatile or fixt alcali's, no conflict follows; mix these two together, a great effervescence arises, even in the cold: 'Tis gently saline, smells ungratefully, put into the eye it gives no pain, nor to ulcers or wounds.

Its Uses.

I have carefully examin'd the blood taken or running out of the body, yet never saw any sign of fermentation, rarefaction, effervescence, ebullition, or intestine motion; hence have I long since departed from *Sylvius's* and the chymists opinion; one would think this would appear in the moment of taking it away: If any persist in affirming it, and say 'tis gentle; how, I ask them, does it appear? if there are opposite salts in the blood, they are so inactive as not to exert their force (*m*).

(*m*) Here the author has made his last push! all intestine motion is hiss'd out of his school, and to enter no more there; but in the name of wonder what has he substituted? truly nothing; he has taken all the pains he is capable of to destroy the doctrine of *intestine motion*, but has settled no other in its place: But all the author has hitherto done is evidently erroneous; for he has endeavour'd to banish acids from our juices, and when he meets with them, he cries out, whence this acid? *Ignoro* (I know not) see him on the *phosphorus*; and when he, *en passant*, owns an acid in the salt of urine, he slurs it, and as his students make no objection, he hopes none besides will: And as for *intestine motion*, he takes it up again, as well as rarefaction, in *Process* 115.

2dly,

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2dly, The blood is a solid, that divides into a solid and a fluid, the serum, which has no sign of an acid in it, all is so calm and easy, no effervescences.

3dly, If there were alcali's and acids in our blood, there would be such expansions in it, that in an instant it might occupy ten times its natural space.

4thly, Serum contains all in it but the cake; hence all the secretions, all nutritious parts, and all necessary for repairs.

Behold, hearers, chymistry throwing out all stains that infected physics and medicine (n).

P R O C E S S CXV.

Serum of the blood digested putrefies.

P R E P A R A T I O N.

Let serum stand in 70° of heat, and it grows thinner, fetid, acrid, alkaline, and affords volatile alcali's.

Its Uses.

Hence obstructions, when the blood stands still and grows putrid, are often open'd spontaneously; the blood never grows sour on these occasions, it grows volatile; it affords no vinous spirit; 'tis true, putrefied liquors do rarefy, and being compress'd do undergo an intestine motion; acids as well as mixt salts and spirituous things hinder putrefaction.

(n) So that our author, like a top, goes round, but not forward.

P R O-

PROCESS CXVI.

Serum unites in boiling water.

PREPARATION.

Put serum into boiling water, it coagulates, like the white of an egg, but not so strongly.

Its Use.

Hence scalding water changes our serum; neither the saline part nor the oils are made volatile by boiling water.

PROCESS CXVII.

Serum coagulates with fire.

PREPARATION.

Put serum over the fire in a spoon, it coagulates; it parts with water, if expos'd to the air; but if it be gently coagulated, it parts with no water; 'tis of a smooth taste.

Its Use.

Hence 100° of heat renders our serum thick and stagnate, and so kills us; hence the use of Farenheit's thermometer in fevers is evident.

PRO-

PROCESS CXVIII.

Serum coagulates with alcohol.

PREPARATION.

Pour on alcohol to serum, they coagulate, and more if the alcohol be hot; 'twill keep without putrefying.

Its Use.

Hence it appears why hot alcohol stops bleedings, and hardens the fibres, and why the drinkers of it die of *polypi* or *scirrhi*: The serum is not so hard curdled as the whites of eggs; it is thinner naturally.

PROCESS CXIX.

The analysis of the blood by distillation.

PREPARATION.

you have 1st, Take away found blood, put it into a cucurbit of glass, in B. M. lute; put it in 150° of fire; a water, that's tasteless, effervesces with neither alcali nor acid, affects not the eye, not acrid, extinguishes flame, scarce odorous.

2^{dly}, Go on till no more ascends, this water is near 7 8ths of the whole.

3^{dly}, Break the cucurbit, take out the mass, it shews no signs of alcali or acid, 'twill powder.

4^{thly}, Put this mass cut into pieces into a retort in a sand-heat, distill, you gain an oily and a whitish salt, then a yellow oil and salt; then change your recipient, and give a strong fire, you get a black oil; here is a spirit, a *sal volatilis oleo-*

sus,

fus, a yellow oil and a pitchy one, like as from the white of an egg. Let your retort be large, or the earth will swell and hinder distillation, and break all.

5thly, In the retort is earth and coal; calcine in open air, it grows white, which contains a sea-salt, which will give out an acid; hence serum and whites of eggs resemble each other; I question whether some speak truth, when they say they can get a phosphorus from this earth.

Its Uses.

The fetid water then is the most volatile part of our humours, as well as the greatest part; our natural salt is never so volatile, as to be elevated by a heat three times hotter than our natural heat: and yet we die with a heat that exceeds the natural one by 110th; hence as nothing volatile ascends by a heat thrice greater than the natural, there is nothing volatile then. (o)

The pitchy oil coheres strongly.

Without water nothing acts.

The heat, if small, incrassates; if greater, it attenuates; if 270° , it thickens it, beyond this it renders it alcalious.

PROCESS CXX.

Horse-hoofs distill'd.

PREPARATION.

Take clean horse-hoofs, put them into a retort, into a recipient, distill in a sand heat, you get a

(o) The argument is like this, to wit, Hartshorn does not afford a volatile salt without a great degree of heat, therefore there is no volatile salt in it.

water, then a fatty streaky water, then a salt, an oil, more salt and red oil, and at last a black oil, and in the retort a black earth; and we get the same from horns, silk, nails, &c. and from hartshorn distill'd from an iron retort, and the earth is burnt hartshorn, good against worms.

Their Uses.

All these then afford the same things, only when there is most oil, the smell is most offensive; boiling takes off all the parts from bones and even the muscles, and leaves them dry and sapless, so a heart may be nicely examin'd, as to its fibres, if boil'd thus: Jellies the stronger they are, the less salts and oils they leave in the nerves. I know no difference between these spirits, Goddard's of silk and Boyle's of blood.

P R O C E S S CXXI.

Depuration and separation of such things, as are produc'd from a vegetable that is alcalious (33) or burnt (86) into soot, or putrefied (88) or animals (95, 107, 112, 119, 120); their virtues.

P R E P A R A T I O N.

Mix all that you distill together, give a heat of 150° , you get a spirit and salt; then give 212° of heat, the salt and oil ascend; thus you have a water, which you got at first, now a spirit, a salt and oil; the thick oil is at bottom, rectify the spirit with 100° of heat, you get a fine volatile salt, the water rests at bottom with oil; hence the spirit is a saponaceous body (being to be divided into salt, water and oil); the more the salt is sublim'd, the less oily is it: wash the oils in water, to keep for distilling the salts, put them into a retort, distill,

distill, the oftner you cohobate on the earth, the finer are the oils, till at last you get a transparent and most penetrating oil, tho' you lose much of it, which made Mr. Boyle broach the mutability of principles; this oil cohobated 15 times is discutient, febrifuge, nervine, &c.

Salts are purified various ways; 1st, By resubliming from a sand-heat, and all salts appear to be the same. 2^{dly}, Resublime, putting powder'd chalk along with the salt, the chalk sucks up the oil and makes the salt whiter. 3^{dly}, If to this salt you pour on spirit of salt and resublime, you gain a fine salt, *Phil. Trans. ab. T. 3. p. 335.* All salts are the same, they only differ by the smell of the oils.

Their Virtues.

1st, These salts effervesce with acids and become neutral, and act as such then; 2^{dly}, They are caustick and attenuating; put a scruple of *sal. v. C. sal. arm.* upon the skin, apply upon it a pitch plaster, it makes a black eschar in eight minutes. 3^{dly}, Put volatile salt, alcohol, and water in an alembick, the salt flies off first, it flies off from your hand, it moves our juices, and stimulates our fibres, nostrils, lungs, &c. 4^{thly}, Hence are they good in acid, phlegmatick, watry and lax cases, and in stupors, &c. good in hysticks, hypochondriacks, spasmodick cases; they are emmenagogues in steams; but they are bad in hot and hectical cases, and in alcalious putrid blood; externally they are good to make issues, to eradicate warts, and *Hordeola* of the eyelids, by applying a little, moisten'd, to the part, and putting diachylon over

P R O C E S S CXXII.

Soap of volatile alcali and alcohol.

P R E P A R A T I O N.

Put strong spirit of salt armoniac into a dry glass, gently pour on pure alcohol, there is presently a coagulation white and opaque, shake them, hold down the neck of the glass, nothing falls out, but this presently melts again into a fluid; the saline matter concreting at bottom, sublime, and you get a *sal vol. oleos.* The cooler the season the better the experiment succeeds; the liquors must be exactly pure, if we design to succeed, this is a most penetrating soap, and will deobstrue powerfully, and promote the circulation; good in jaundices without an inflammation; it neither dissolves nor hinders the concretion of stones; it melts in warmth, but in cold it keeps its shape, the soap will be stronger if you mix one 3^d of the dry salt with alcohol; 'tis not stone, for it melts, 'tis call'd *offa Helmontiana*, and distill'd is call'd *Helmont's Alcahest*, but was first found out by *Raymundus Lullius*.

P R O C E S S CXXIII.

The volatile aromatick salt of Angelica.

P R E P A R A T I O N.

Take two ounces of fresh Angelica-roots dug up in *February*, finely sliced, put them into a glass retort, pour on 12 times as much spirit of wine once rectified, then add an ounce of salt armoniac bruised, three drams of salt of tartar; for the recipe

recipient, lute, and give 150° of heat, you get the salt first, and then the spirit of wine; when the watry part begins to come up and dissolves the salt, leave off from distilling, throw away the liquor at bottom, repeat this operation with fresh roots of Angelica to an ounce.

Its Uses.

The salt of tartar detains the acid of the salt armoniac; the salts of tartar, the volatile salt of armoniac, and the acid, help to dissolve the spirit of the Angelica; 'tis *sal vol. oleosum*, is good in all cold, phlegmatick, watry, acid cases; in defect of bile, in hypochondriack and hysteric cases; 'tis stomachick, warming, sudorifick, diuretick, antiparalytick, antispasmodick, and stimulating; we owe this to *Basil Valentin* and *Sylvius*: This example may serve for all the rest.

P R O C E S S CXXIV.

The production of a volatile, aromatick, compound salt.

P R E P A R A T I O N.

Take the compound spirit of ^{Proc.} 72, 24 ounces, put it into a retort, add six drams of salt of tartar, five ounces of salt armoniac, finely powder'd; Distill, you have a volatile oily salt.

Its Uses.

This is better than the former.

PROCESS CXXV.

A preparation of a sal vol. oleosum.

Take any distill'd oil, two drams, dissolve 'em in 20 ounces of alcohol, alcaliz'd by 67, then mix two ounces of any volatile salt, and you have, by shaking 'em together, the salt we speak of.

Its Uses.

Thus may we extempore make any *sal vol. oleosum*; if then we know the virtue of any plant, we can mix the oil of that plant with these salts.

PROCESS CXXVI.

An extemporaneous sal volatile oleosum.

PREPARATION.

Take salt of tartar one pound, salt armoniac three pounds, any aromatics powder'd 12 pounds, spirit of wine rectified 36 pounds, mix 'em and shake them together, and you have the salt desired; or, take salt of tartar three pound, salt armoniac nine pound, put 'em into a cucurbit with any aromack oil one pound, sublime with so gentle a heat that nothing but the salt will ascend. gather this, 'tis the *sal volatile oleosum* so much known in *England* against hysterick disorders.

Its Uses.

This is the famous *sal volatile oleosum* of *Sylvius* so much in use in *Europe*; 'tis dangerous in warm and inflammatory diseases; if it is much snuff'd up the nostrils, it destroys the *Membrana Schneideri*, and disposes to hæmorrhages; hence, by putrefaction

putrefaction and distillation, we get a volatile spirit mixt with water; 2. a water nearly elemental; 3. a volatile salt; 4. a thin volatile oil; 5. a thick oil; 6. earth; 7. phosphorus; 8. sal-marine, where it has been made use of for diet, otherwise not (*p*); we can never return these to their former shape, part of the volatile salts fly off into the air and perform their offices in vegetation.

PROCESS CXXVII.

The phenomena of blood and serum in air, water, fire, acids, alcali's, neutral salts, spirits, oils and soaps.

PREPARATION.

1st, With air from 32 to 94 degrees of heat it parts into serum and cake, it divides and putrefies and flies off; in cold air from 31 to one degree the serum is congeal'd, but when it thaws it putrefies and becomes volatile and flies off; in a heat of 120° to 214° it coagulates, but a greater than this dissolves it; it admits of a certain proportion of air. 2^{dly}, Water, from a degree of 32 to 94, unites with it; also it unites with it when boiling; if it be shaken, that will not keep it fluid, nor dissolve it when coagulated; it putrefies in water, if it be expos'd to the air; water then

(*p*) It is very observable that our author every where industriously endeavours to avoid owning an acid in animal juices; and as salt armoniac is an animal salt from our juices, he has avoided here also to shew us it contains an acid spirit; but that it does is evident, for take the *sal febrifugus*, powder it, mix it with bole powder'd, distill from an earthen retort with a reverberatory fire, and you get an acid spirit: Whether this be the acid of the sea-salt in our blood and from vegetable diet, 'tis all one, we must acknowledge there is an acid in our juices.

does not, whether hot or cold, dilute the cake of the blood. 3^{dly}, Fire, from 33 to 100°, makes it volatile; to 220° it coagulates it, but a greater putrefies and dissolves it. 4^{thly}, *Mozel* or *Rhenish* wine, vinegar, or its spirit, do only dilute the blood; spirit of nitre coagulates it into a black, spirit of salt into an ash colour; spirit of vitriol and sulphur into a white; volatile alcali scarce coagulates it, but makes it red; fixt alcali dissolves it; *sal volatile oleosum* coagulates a little; salt armoniac, nitre, salts of fountains, gem, of the sea and borax, make it red, and hinder its coagulating, so do common soaps and others; alcohol coagulates it, oils inviscate it: In all these we observe no fermentation, only change of colour. *Tartarus Tartarisatus* does the same as the last, so does *Venice* soap; *Helmont's* tincture of salt of tartar rather coagulates it, but not readily; that salt in Process 108, made of spirit of vinegar and volatile salt, attenuates, and keeps its colour. 5^{thly}, Vitriols make it thicker and change its colour; so *Vitriolum Martis* makes it black and coagulates it, so do *sacch. Saturni* and *merc. subl.* particularly the *oleum Mercurii* made with oil of vitriol; and yet mercurials given inwardly attenuate the blood.

Their Uses.

Thus we learn by mixing medicines with the blood what effects they have upon them; injections have taught us the same; however, when medicines are swallow'd we don't always observe these effects; effervescences are not made within the blood: *Paracelsus*, *Helmont*, *Cartesius*, *Sylvius*, and others use this form, when they would explain the effects of medicines in the body; some, forsooth, condemn acids, because they coagulate; *Hippocrates* says 'tis good in hot diseases, and yet the blood is incrassated in any of these; we can't safely say any thing

thing of the medicine till its species be determin'd, for some things that are reputed dissolvents, coagulate the blood.

The Third Part of Chymical Operations upon FOSSILS.

First, upon S A L T S.

P R O C E S S CXXVIII.

The trial of Nitre.

This is not the Nitre of the ancients, call'd *Αἴτριον*; it is much us'd in preparations of fossils; it approaches in nature to the salt of vegetables and animals, and is in such use no sea-salt (*q*).

It runs in a crucible, but does not flame till you throw in somewhat combustible. It neither effervesces with acids nor alcali's, when dissolv'd in water.

Its Uses.

Hence 'tis neither alcali nor acid, nor inflammable *per se*, but fuses and reunites (*r*).

(*q*) *Du Hamel.*

(*r*) Thus he argues on: 'tis neither, says he; because it is both, say I; for it affords an acid spirit and an alkaline fixt salt; and when it is already saturated, would he have it still effervesce? monstrous!

P R O-

P R O C E S S CXXIX.

The depuration and crystallisation of nitre.

P R E P A R A T I O N.

Take common nitre, dissolve it in six times its quantity of water, boil and strain, exhale upon the fire to a pellicule, put it in the cellar, let it crystallise; or dissolve nitre in eight times the quantity of boiling water, strain, pour in oil of tartar till it is no longer disturb'd, boil till the water becomes limpid and a pellicule is at top, set in a cellar to crystallise; boil the remainder, till a pellicule appears, set it to crystallise, as before, apart, this do till nothing remains but a fattish liquor, it tastes acrimonious.

Its Uses.

This cools the blood, tempers the efforts of venery, makes the blood red, and changes into another nature in the blood, otherwise than common salt does; it preserves meat from putrefaction, and makes it red; 'tis good in inflammatory diseases, quenches thirst, and does not hurt with its acrimony: Crystallisation happens from the attraction of the salts to each other, and the repulses of the water and other salts which makes us distinguish this from others, for nitre is easily distinguish'd from sea-salt by its figure, it dissolves silver, but will not touch gold, but a little salt join'd to it makes it *aqua regia*, the crystallisation throws all the oil of tartar to the bottom, these crystals are always of a certain figure, and are pellucid, unless you lay them upon a glass and heat 'em by a fire, then they grow opaque, yet this opacity disappears upon a second crystallisation.

P R O

PROCESS CXXX.

Nitre with tartar becomes an alcali by fire.

PREPARATION.

Take nitre and cream of tartar, of each equal parts, powder them and dry them, put them into a cucurbit, throw in a live charcoal, a deflagration ensues, continue to do thus till all is deflagrated, and you have the alcali of nitre, white drawing upon a green.

Its Uses.

We see how the cream of tartar changes the nature of the nitre and gives a new salt that did not pre-exist it, that is alcalious in all its effects, it differs from other alcali's, and still retains some acid of nitre, because oil of vitriol makes it steam; there is no nitre in *Europe* but what has fixt salt of wood in it, this salt melts in the air. (s)

PROCESS CXXXI.

The alcali of nitre made with live charcoal.

PREPARATION.

Take pure nitre, put it into a crucible, let it stand on a charcoal fire till it runs, throw in a live charcoal, when the deflagration is over, throw in more, thus continue to do till it ceases to defla-

(s) Just now he told us that a fixt salt did not pre-exist, and you see he immediately subjoins that all *European* nitre has the salt of wood (which is a fixt salt) for its basis, thus he says on, and makes no bones of contradicting himself.

grate,

grate, then let it stand for some time, break the crucible and take it out.

Its Uses.

We see how great an impulse and repulse arises between the inflammable matter and the nitre: the nitre is not inflam'd by the coal, for as soon as the coal is consum'd, the nitre is at rest. (t)

The cinders after the deflagration, turn into an alcali that melts in the air, which deposit a great deal of earth, or if you dissolve this salt in water throughly, and inspissate all this water to the thickness of an oil, you have the same liquor that runs in the air, the earth that is deposited shews so much salt of wood concurr'd to the making of this alcali, 'tis call'd fix'd or alcalifate nitre.

P R O C E S S CXXXII.

Sal Prunellæ from nitre.

P R E P A R A T I O N.

Melt nitre in a crucible, pour it out upon a marble, dissolve this in rain-water, in which have been infus'd the flowers of red poppy, evaporate to a pellicule and crySTALLISE, this is call'd *lapis Prunellæ*, or *crystallus mineralis*, reputed an aceanum and anti-inflammatory; or to nitre, 4 ounces melted in a crucible, throw in a scruple of flower of brimstone, it fulminates, this pour'd out, is *sal Prunellæ*.

(t) This paragraph is like the following, the spirit of nitre is not inflamed by the essential oils, which it causes to flame; but pray what is it but the collision that raises this flame in a proper subject? The nitre is at rest, because part of it is fled, which caus'd this flame.

Its Uses.

This has the same uses as the preparation in 129th, yea that is better; hence came the invention of gun-powder; 'tis made of sulphur, nitre and charcoal, it has the name from the German word *die Braune*, as was the herb *Symphytum Petraeum Lobelii* call'd *prunella* because it cur'd a quincy that was epidemical.

P R O C E S S CXXXIII.

Sal polychrestus.

P R E P A R A T I O N.

Take nitre, put it in a crucible, melt it, throw in a little pure sulphur, let them deflagrate, this continue to do till you have thrown in an equal quantity of sulphur to the nitre, this is the *sal polychrestus*; or mix the nitre and sulphur in equal quantities, and throw 'em in and deflagrate, 'tis the same salt, dissolve either of these in 5 times its quantity of boiling water, strain and crystallise as usual, 'tis neutral salt like the salt of hot baths.

Its Uses.

The sulphur contains an oil and acid, the oil and spirit of nitre go off and leave the acid and the sulphur united to the fixt salt, the deflagration you see which sulphur makes, is a neutral salt, whereas the charcoal made is an alkaline, the *Parisians* gave it this name, its dose is two drams in a morning, dissolv'd in 2 ounces and a half of water, drinking above it four or six ounces of whey, it sometimes vomits, often purges, and proves diuretick as well as diaphoretick; 'tis good in hot rheumatisms, opens obstructions gently, corrects putrid bile,

bile, stimulates gently, good in acute diseases, certainly takes off tertians and sometimes quartans, if to nitre fus'd you throw in salt armoniac, it burns, this salt deserves to be enquir'd into.

P R O C E S S CXXXIV.

Glauber's Spirit of nitre.

P R E P A R A T I O N.

Take 18 ounces of nitre, put it in a glass retort, pour on 6 ounces of strong oil of vitriol, immediately clap on a large recipient, luted with lime, marl and sand, give a gentle fire, which encreased by degrees till all is come over, and you get the red spirit of nitre which always smoaks, stop it up close in a proper viol with a glass stopper, it will keep for years.

Its Uses.

The oil of vitriol presently falls upon the nitre and produces a choaking smell, which the operator must endeavour to avoid, this is true spirit of nitre, that has no oil of vitriol in it, as appears by experiments, and whether you put much or little oil of vitriol, 'tis much the same; the oil and the remainder of the nitre become a vitriolated tartar, the oil attracts the salt stronger than the spirit of nitre does, 'tis hard to conceive any principle in nature like this acid; this spirit of nitre we shall use for the future in our chymical operations; it was found out by *Glauber*, which he sold dear, kept it long as a secret, and then divulg'd it.

PROCESS CXXXV.

Glauber's spirit of nitre dulcified.

PREPARATION.

Put into a high glass 8 parts of alcohol, prepar'd with any alcali, pour in gradually some few drops of spirit of nitre, shake 'em together, thus continue to pour on till there be one 8th part of spirit of nitre to the alcohol, digest and the affair is done. *Hoffman*, p. 121. I have often shew'd the dangerous effects of pouring these two spirits together, for pouring 2 drams of this spirit to 6 or 7 of alcohol, a strong ebullition follows, and a steam arises that will choak the operator.

Its Uses.

A strong effervescence follows the mixture of these two, and if you clap a candle to the steam it takes fire, runs into the glass and makes all fly, the smell is like that of southernwood, this dulcified spirit is anti-septical, balsamick, deterfive, dissolving and anti-putrid, appetising, carminative, nephritick, antiscorbutick, corrects stinking breath, and being well diluted with water makes the teeth white in an instant, but must not be imprudently us'd, its dose is 30 drops at a time.

P R O-

P R O C E S S CXXXVI.

The renewing of Nitre from 130, 131, 134.

P R E P A R A T I O N.

Take the fixt alcali of nitre, pour on gradually spirit of nitre, till the effervescence ceases, dilute this with water, exhale to a pellicule and crystallise; this is true nitre; its crystals are octohedral, prismatical and pellucid, as nitre; any fixt salt would serve this turn.

Its Uses.

Mr. Boyle wrote a whole treatise on this salt; it shews us how a most volatile, strongly smelling acid loses all its fierceness, and becomes a neutral salt; so great an attraction is there between an acid and alcali, the air is struck out during this conflict; this salt does not run as the alcali did; the alcali is feminine, the acid masculine: Whether all neutral salts arise in this manner, I know not, and I doubt it much; however, I certainly know that nitre is thus produc'd from the earth of animals and the fixt salt of vegetables or lime.

P R O C E S S CXXXVII.

Nitre regenerated not fixt.

P R E P A R A T I O N.

Take three ounces of the alkaline salt of nitre, dilute it with sixfold its water; pour in drop by drop spirit of nitre to the point of saturation, or till it ceases to effervesce; dilute with double the quantity of water, exhale to a pellicule and crystallise;

stallise; repeat this operation till you have got all; this is true nitre.

Its Uses.

This experiment is the same as the former, and serves the same purposes; so from an odoriferous body is made one inodorous; from a hot caustic is made the coolest salt; from an alcali and acid is made a neutral, which, if fix'd, is a fine nitre; but if the salt be volatile, 'tis a semi-volatile nitre; hence, in an instant, is found that volatile nitre which the chymists heretofore labour'd so much to find.

P R O C E S S CXXXVIII.

Alcahest Glauberi.

P R E P A R A T I O N.

Take the fixt salt of nitre, expose it to the air and it runs.

Its Uses.

This is the famous alcahest of *Glauber*, reputed as an arcanum, it differs not from oil of tartar.

P R O C E S S CXXXIX.

Nitre nitrated.

P R E P A R A T I O N.

Take eight ounces of nitre dissolv'd in water, drop in 30 drops of spirit of nitre, evaporate to pellicule and crystallise.

Its Uses.

Thus may we make it as acid as we please, but it flows ; it may be us'd in ardent fevers.

P R O C E S S CXL.

Vegetating nitre.

P R E P A R A T I O N.

Take the salt remaining at bottom after distilling *Glauber's* spirit of nitre four pound, oil of vitriol one pound, then all the spirit being expell'd, expose the salt to the air, it gathers a down as if it were vegetating ; dissolve it in water, exhale it to a dryness, and it branches out but melts with heat and revegetates with cold. This was, I suppose, the chymists resuscitation of plants.

P R O C E S S CXLI.

Spirit of nitre with bole.

P R E P A R A T I O N.

Take pure nitre finely powder'd ℥ijss , common bole 4 ℥ss , mix them, and put them into an earthen retort, fit a recipient, and lute ; give a small fire which encrease by degrees till the retort is red hot, you get the spirit of nitre, which however is not so strong as that of *Glauber* ; we get from the nitre 9 in 16, or one half ; I boil'd the remainder and inspissated it, it tasted alcalious, and prov'd such by pouring on acids, tho' not perfect. We must observe that the peat-turf's be warm, lest they break the retort, and take care of the smoke.

Its Uses.

First, nitre melted affords no acid spirit, but runs thro' the retort and sweats off. *2dly*, Nitre with three parts of bole, marl or tabacco-pipe clay put into a crucible, does not run but sends forth acid fumes. *3dly*, Hence the interposition of the powders makes it afford the spirit, and perhaps the bole itself gives some spirit, for 'tis said bole us'd once will not serve again. *4thly*, Homberg computes the acid to the alkaline part, to be as 480 to 183, and I have produc'd 9 10ths; hence the acid did not pre-exist, which never appears without the fire, therefore produc'd by it. *5thly*, If colcothar or calcin'd alum be made use of, you get the spirit in the same manner, but the spirit of these two join in with the salt remaining at bottom, a strange transmigration! as far as we know the oils of sulphur and of vitriol are all one thing, and this joins in with the body remaining at bottom (n). *Aqua fortis* is but a spirit of nitre, whoever says that the whole nitre can be converted into spirit are mistaken. *6thly*, The fume of this spirit distinguishes it from all others, dissolves silver.

P R O C E S S CXLII.

Purification and crystallisation of sea-salt.

P R E P A R A T I O N.

Dissolve sea-salt in six times its quantity of pure rain water, strain often over till it becomes

(u) Will spirit of alum or of sulphur effervesce with nitre as oil of vitriol or spirit of salt will do? no surely, therefore they are distinct in their own nature.

clear and exhale one sixth part, let it stand till it settle no more, then exhale to a pelticle, set it in a cellar till it crystallises, this is for chymical uses, thus we may exhale and crystallise till no more crystals appear; if you inspissate and let it run, this salt flies all into the air.

Its Uses.

All salts crystallise into their proper forms, this salt dissolves gold, preserves meat from putrefaction, and if we mix salt with nitre and distill it proves an *aqua regia*.

P R O C E S S CXLIII.

Glauber's *spirit of salt*.

P R E P A R A T I O N.

To three parts of the aforesaid crystals, pour one of oil of vitriol, they effervesce, take care of the steam, clap on to the retort, in which they are a large glass recipient, which lute well, clap under it a small fire, and you get the spirit, gently encrease the fire till all is got off, this spirit always smokes, but the smoke is pale, if you rectify it you get a strong volatile. 2. if you mix water along with the salt, and pour in the oil of vitriol gradually, the heat ensues, the spirit you get thus does not smoke; if you gently rectify this spirit, you get an acid water fit for juleps. 3. The *Sal mirabilis Glauberi* is at bottom of the retort.

Its Uses.

This is a strange production of spirit of salt by oil of vitriol, 'tis also strange that mixing the water hinders the steam, and that 100° of heat should

should produce a wholesome spirit (x); I could not get above one third part spirit free from water; this spirit is gratefully stomachick, appetizing, a corrector of putrid salts, takes off gangrenes of the jaws and tongue, hinders the generation of stones, takes off the stranguries of old age; if to this pure spirit you add three parts of alcohol, you gain a balsamic acid, it dissolves gold, this was *Glauber's* invention also.

P R O C E S S CXLIV.

Spirit of salt with bole.

P R E P A R A T I O N.

First, Decrepitate salt, by this decrepitation it loses one 4th part of its weight; this decrepitation is necessary before we distill it, for otherwise it would crackle and break the vessels; take three pound of this decrepitated salt, bruis'd in a warm mortar, mix with it bole 10 pound, put 'em into two retorts, lute a recipient, encrease your fire gradually for three hours; then by encreasing your fire to the last degree, and distilling for six or eight hours, you gain the spirit; let all cool, take it out, you gain 3 from 8 ounces; boil the salt at bottom of the retort in water, inspissate and crystallise, you have a salt at bottom. *Beguinus* is mistaken in saying he could turn all the salt into spirit.

Its Uses.

This spirit requires a stronger fire than that of nitre, at the end a whitish yellow matter sticks to

(x) *N. B.* In the 151st Process he denies the pre-existence of an acid; here he cannot deny it.

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the recipient that is very styptic, the salt at bottom serves to make *Buttler's-stone*, for its virtues, see *Process* 143.

P R O C E S S CXLV.

Sal mirabilis Glauberi.

P R E P A R A T I O N.

Take the salt, remaining at the bottom of the retort after the distillation of spirit of salt, put it into a crucible till it flows, take care no coal fall into it, dilute with warm water, strain, inspissate to a pellicule, put it into a cellar, and you have an icy mass; dissolve this salt in six times as much hot water, inspissate and crystallise again, you have crystals that will not run in the air.

Its Uses.

This was *Glauber's* invention, which differs from *Tartarus vitriolatus* in its effects, for powder it, put to it three parts of vinegar, wine, beer, or water, it freezes them into ice; being fus'd in a crucible, and put into antimony, it dissolves it. See *Glauber*, *Boyle*, *Becker*, *Stabl*, and *Hornberg*; it corrects putrefaction and gangrenes, 'tis purgative and diuretic.

P R O C E S S CXLVI.

Regeneration of sea-salt.

P R E P A R A T I O N.

Take four ounces of oil of tartar, put it into 1
ounces of water, heat it, put in drop by drop sp

rit of Glauber's salt, or the other with bole, saturate till the effervescence ceases, let 'em settle, strain, exhale to a pellicule, put 'em in a cellar, crystallise, this is pure sea-salt.

Its Uses.

We see a compound salt arises from a mixture of acid and alcali; for the rest, see *Process* 136.

P R O C E S S CXLVII.

The regeneration of salt armoniac.

P R E P A R A T I O N.

Take 4 ounces of spirit of salt armoniac, pour into it so much spirit of salt gradually as will saturate it, strain this liquor, inspissate to a pellicule, and crystallise or evaporate the whole liquor, and you have a salt armoniac at bottom.

Its Uses.

This is a semivolatile sea-salt, and a neutral one, 'tis hard to shew any acid in nature, unless, as Mr. Boyle, we could digest sea-salt so as to make it afford its acid easily, *Mech. qual.* p. 234.

P R O C E S S CXLVIII.

Tartarus vitriolatus.

P R E P A R A T I O N.

Take three ounces of oil of vitriol, dilute with three p. of warm water, pour in oil of tartar till the effervescence ceases, strain evaporate

k 4

rate to a pellicule, crySTALLISE, and you have the salt; the metallick parts subside to the bottom, and the clearer 'tis from blue or green, the better 'tis, the same may be done with any volatile spirit; 'tis ponderous and aperient.

Its Uses.

It resists putrefaction and stimulates, we see how acids join'd to alkalis grow mild, how poisons may be cured, we find how water lurks in salts and how to extricate them, we see that 60 p. of spirit of nitre contain but 19 of true acid, that 52 of spirit of salts contain but 13 of acid, and that 60 of oil of vitriol contain 37 of acid, there are therefore few sincere acids, spirit of salt, of fountains and *sal gemm.* are the same thing.

Secondly, S U L P H U R S.

P R O C E S S CXLIX.

The examen of sulphur.

P R E P A R A T I O N.

Sulphur is of various colours in the mines, viz. yellow, red, and ash-colour; by melting it in a crucible it grows red and opaque when cold; it burns blue, and all of it consumes; its steam choaks; if it melts only and does not flame, its smoke is not choaking, by melting it flies all off; when cold 'tis friable, it flows like pitch, does not mix with water nor dissolve with alcohol, effervesces not with acids or alkalines; it purges, cures eruptions and worms.

Its Uses.

The chymists call it the resin of earth.

PROCESS CL.

Flowers of brimstone.

PREPARATION.

Take common brimstone six ounces, put it into an earthen retort, fit a glass recipient to it, lute with clay, ashes, and water, distill from a sand-heat; the neck of the retort must bend downwards; you gain the flowers; encrease the fire at the latter end so as the sulphur don't melt. This is enough for an experiment; but they who distill quantities, have a whole chamber for the recipient and another for the retort; hence the flowers are so cheap.

Its Uses.

This is only a depuration of the sulphur, and it serves better for liniments, &c. so long as the air does not come to the fire it does not flame.

PROCESS CLI.

Spirit of sulphur.

PREPARATION.

Take flowers of brimstone, put 'em into an earthen vessel, fuse the sulphur, then kindle it, hold over it a glass bell moisten'd with the steam of warm water; this bell must have a beak, to which you must join a receiver, then pour in more sulphur, and you get a spirit; the nearer you hold
the

the bell to the steam, the better; the moister the weather, the better; this spirit is very heavy, take care of the steam. *Homburg* found out another way, whereby he prepar'd 25 ounces in 24 hours; he prepar'd a large glass recipient, and made an aperture with a diamond of 8 or 10 inches diameter in the very center, and broke it off with a hot iron, and suspended it; under this he put an earthen cylindrical vessel, into which he threw the sulphur, which he kept continually burning, always throwing in fresh and taking away the crust, observing the former cautions.

Its Uses.

The flowers have no metal in 'em; the surface of it only burns, and so 'tis consum'd gradually; the vapour is fatal, because 'tis an acid; their steam stops fermentation and putrefaction; hence burning of sulphur is so anti-pestilential; the steam of it kills insects; all experiments shew us this experiment is oil of vitriol, only 'tis freer from the metal; sulphur contains a 10th part of acid; *Homburg*: Perhaps this is the reason it unites not with alcohol, and the reason why alcohol alcalised dissolves it; why sulphur is not dissolv'd by acids, and saturated with them admits no more; why metals are corroded by it, (x) for the acid and metal attract each other; hence let little chymists cease to fix sulphur, for 'tis already fixt; let them cease to fix metallic mercury, for it does not enter it, nor give the weight and consistence requir'd, therefore does not make it malleable: 'Tis good in inflammatory, hot, putrid cases, and *Helmont* says it prolongs life.

(x) The author at last does allow that acids in compounds do produce their natural effects; why will he not allow the same in animals as in fossils?

P R O C E S S CLII.

A solution of sulphur in a fixt alcali.

P R E P A R A T I O N.

Take nine drams of flower of brimstone, melt them in a crucible, add two drams of fine alcali, it acquires a new smell and grows red; stir them about with a tobacco-pipe, pour it upon a cold marble, 'tis a red, brittle mass, soluble in water.

Its Uses.

The alcali having dissolv'd the acid, turns the sulphur into a soap; hence appears the use of fixt alcali's in metallurgy, for the acid in the sulphur makes the metal brittle; hence we may know whether any glebe contains sulphur, by mixing fixt alcali along with it, for then it gives the alcali a colour and smell.

P R O C E S S CLIII.

Solution of sulphur in volatile alcali.

P R E P A R A T I O N.

To flowers of brimstone pour on any volatile spirit, distill and cohobate, and the sulphur is dissolv'd; if they are kept long in a shut vessel and shaken together, it gives a golden tincture.

Its

Its Uses.

Whether this be pectoral, as a great chymist says, I doubt. (y)

P R O C E S S CLIV.

Solution of sulphur in alcohol of wine.

P R E P A R A T I O N.

To sulphur open'd by a fixt alcali pour on alcohol to five fingers height, whilst the solution is yet warm, it gives a very red and fragrant tincture, which decant, pour on fresh alcohol till it refuses to give a tincture, pour off, and leave the dregs at bottom, which are an ash-colour'd saline terrestrial matter.

Its Uses.

Hence appears the power of alkalines upon sulphurs to make them dissolve in alcohol; this is the tincture which some boast to be metallic; so I remember an *aurum potabile* which was bought at a high price, made with gold mix'd with crude antimony, mix'd upon the fire with salt of tartar, the gold remain'd, but the tincture of the sulphur with antimony was obtain'd. This tincture however, tho' in the main a cheat, is good against acids, and is warming; it grows milky in liquors, but I could not discover, by *Willis's* leave, any antiphthifical virtue in it.

(y) This preparation is certainly pectoral, and, as the chymist he mentions says, is good in astmatick cases, for 'tis irritating and lubricating.

P R O C E S S C L V.

Syrup of sulphur.

P R E P A R A T I O N.

Take a dram of alcaliz'd sulphur, dilute it with three drams of water, it dissolves; add three or four times the quantity of sugar, or any syrup, liquorish, &c. *m. f.* syrup.

Its Uses.

This does not agree in consumptions where people cough and sweat; this shews how sulphureous bodies may be mix'd with water.

P R O C E S S C L V I.

A solution of sulphur in any express'd oil.

P R E P A R A T I O N.

Take four pound of oil olive, heat the oil, put in 1 4th of sulphur, let them continue upon the fire till they mix, and thus you make a solution of your sulphur; this is the balsam of sulphur that heats, mollifies, and dissolves externally, and internally is prais'd against putrefactions and supurations of the kidneys, lungs, &c. but it dries too much, gives thirst, and palls the appetite; however, I advise a sparing use of it; they concluded this, because it cur'd external ulcers; it dissolves no metals except lead, 'tis therefore a menstruum for some things.

P R O-

P R O C E S S CLVII.

A solution of sulphur in distill'd oil.

P R E P A R A T I O N.

Take flower of brimstone one ounce, ethereal oil of turpentine six ounces, boil in a wooden furnace till it dissolves; decant this, pour on more oil of turpentine, boil as before, till you get all the tincture; there are crystals that remain in the pipkin, have a care of stopping the pipkin whilst it boils.

Its Uses.

This oil does not dissolve it so well as common oil, but this balsam consists of the oils of sulphur and turpentine, and the acid of sulphur; 'tis a good remedy for pains and the nerves, for sanious, fistulous ulcers; 'tis warming, diaphoretic and diuretic, it gives the urine a violent smell; this is the terebinthinate balsam of sulphur; it may be made with any other oil, oil of aniseeds, amber, juniper.

P R O C E S S CLVIII.

Soap or balsam of sulphur.

P R E P A R A T I O N.

Take the Process of 156, proceed as in 73; or Process 157, and proceed as in 74.

Its Uses.

This shews the method of making soaps out of sulphur, but that made in 73 and 74 is not so rancid.

P R O

P R O C E S S CLIX.

Balsam or soap of sulphur united with alcohol.

P R E P A R A T I O N.

Put on to the balsam of sulphur terebinthinated, or its soap, five times as much alcohol; let 'em rest a while, the crystals precipitate, the sulphurs dissolve.

Their Uses.

Acids pour'd on to any sulphureous tincture, precipitate it into a white fetid powder, *e. g.* to any gold tincture pour on vinegar, and 'twill succeed.

P R O C E S S CLX.

The making of sulphur out of oil and acid.

P R E P A R A T I O N.

Take four ounces of oil of turpentine, pour in gradually one ounce of oil of vitriol, they effervesce, grow red, and smell; digest for eight days, then distill, an oil appears, a pitchy bitumen is at bottom, distill on, you gain sulphur. (z)

Its Uses.

Hence the basis of sulphur is acid and oil intimately united; if it is burnt, one part affords acid, which is choaking, antialcaline, antiseptic, and ponderous; the other gives oil; the acid of nitre, alum, &c. join'd with oil, give a sulphur; this shews how to explain a great many arcana, *e. g.* let *sal mirabile Glauberi* flow in the fire,

(z) N. B. Boyle.

throw

throw in charcoal, you have a flame, and a red matter at bottom; dissolve in water; a true sulphureous matter appears; carefully observe therefore whether any acid be in inflammable bodies.

P R O C E S S CLXI.

The making of sulphur from alcohol and acid.

P R E P A R A T I O N.

In a glass cucurbit put eight ounces of alcohol without alcali, put in oil of vitriol, gradually shaking afterwards the heat and steam choakingly, pour in thus 1 8th of oil of vitriol, and they smell like southernwood, but the steams are choaking, the liquor becomes red, stop up the vessel, digest for five days, then distill gently, till the matter grows black, this will be very fragrant, then begins some acid to arise, change the recipient and gently distill for fear the matter rarefy, a fetid phlegm ascends; change the recipient again, a fetid liquor ascends; at the bottom remains an acid black matter, not inflammable but brittle like sulphur.

Its Uses.

Thus have we three distinct choaking liquors and sulphureous dregs; there is an effervescence 'twixt the acid and the alcohol, and a fragrant smell, but when digested the smell is like garlick. *First*, Is separated the oil of vitriol. *2dly*, A fetid, acid, watry, sulphureous, not inflammable liquor, altho' there was no water discover'd in the alcohol. *3dly*, Aromatic, limpid, ponderous liquor dissolving in spirit of wine, and then they turn yellow, which is the *oleum vitrioli dulce*; the dregs at bottom by pouring on water turn into an acid oil of vitriol, is not this *Crollius's* philosophical

cal spirit of wine, or *Paracelsus's* dulcified spirit of vitriol, which, he says, is antiepileptic, is it not the *aurum potable* of *Paracelsus* prepar'd with gold and digested in the stomach of an ostrich; this operation excites the curious, here is not sulphur but something sulphureous.

Thirdly, METALS.

PROCESS CLXII.

Vitriol of Iron.

PREPARATION.

Take oil of vitriol, one pound, drop it gradually into 8 pound of water, shake and mix, then throw in filings of iron, a strong effervescence ensues, with a garlic smell; continue to throw in this iron till no effervescence ensues, strain and filter this styptic liquor thro' cap-paper, exhale the liquor to a pellicule, put them into a cellar and you have green crystals, which we call copperas.

Its Uses.

The Iron attracts the acid; hence this is metallic salt and melts at the fire, some call it the *magisterium martis*, it melts in water, and is given internally to 12 ounces, where one pound of salt dissolv'd in 100 of water are made use of; 'tis gently cathartick and makes the stools black, kills worms, and corroborates the fibres; some have thought chalybeat waters were produc'd in this manner, but *Hoffman* has undeceiv'd us, 'tis bad in putrid fevers, because the alkaline (y) salts of the blood preci-

(y) N. B. He denies fixt salts in the blood, he denies volatile salts also; and says the heat to a certain degree produces them, and yet here you see he owns them!

pitate it, women who take steel have nidorous belchings, and their excrements grow black, they are good in acid constitutions; hence vitriols are made in the earth, by the acid preying on the steel (z).

P R O C E S S C L X I I I.

Vitriol of Iron with Ludovicus's Tartar.

P R E P A R A T I O N.

Take one pound of vitriol of steel, four pound of cream of tartar, 20 pound of water, boil 'em and stir them, take care of burning them, put them into a glass vial, pour in common spirit of wine to four fingers height, boil 'em for an hour when they are cold pour out the red liquor, pour more spirit of wine to the dregs, and proceed thus, till they afford no more tincture, distill this liquor till a pellicule appears, you get crystals, or if you only inspissate to a pellicule, you have the same crystals, this is call'd *Ludovicus's Tartarus Martialis*.

Its Use.

Physicians have thought steams might be readily convey'd into the blood by force of acids; and that it would be precipitated by alkalines; hence this preparation, it opens, attenuates, corroborates, stimulates, is cathartic and diuretic; hence is good in anasarca's, scurvies, jaundices, hypochondriac and hyfteric diseases, the rickets and worms. Its dose is a dram in six drams of water, repeating it thrice, drinking above it four ounces of whey.

(z) If so, either *Hoffman* or *Boerhaave* are mistaken, *Hoffman* says, the *acidule* are not produc'd by this union.

a morning fasting, walking so as not to sweat for nine days together; but a few drops are sufficient for children; a dram of chalybeated tartar serves for the same uses; if it moves the belly, so much the better.

P R O C E S S CLXIV.

The white ash-colour'd and red calx of vitriol martis.

P R E P A R A T I O N.

Put half an ounce of the best sort of steel into a dry glass mortar, powder it fine, give it 150° of heat, it becomes a white calx, sweet and styptic; by 300 degrees of heat, it becomes ash-colour'd, and of an austere taste; but by an open fire, it becomes red and caustic.

Their Uses.

Thus vitriols, by calcination, lose their pel-
lucidity in water; the first calx is styptic gently, and may be mix'd with sugar for children; the second is somewhat more restraining, but both these two are soluble in water; the third is caustic for the callous lips of ulcers, and stopping fluxes externally, and is not soluble in water, the longer 'tis calcin'd, the stronger it is; wash this in water till the water becomes insipid, and you get a *crocus martis restringens*; crystallise, and you get salt of vitriol.

PROCESS CLXV.

The liquor of mars per deliquium.

PREPARATION.

Expose the colcothar aforesaid to the air, it becomes a red liquor call'd *oleum martis*.

Its Uses.

It attracts the water of the air, and is styptic.

PROCESS CLXVI.

The golden tincture of vitriolum martis.

PREPARATION.

To the red calx or colcothar pour on 20 times its quantity of spirit of salt, this digest for a month, you have a golden styptic liquor; you may repeat this operation till you get all the tincture.

Its Uses.

Here the steel is dissolv'd in the spirit of salt, which will produce a black colour, as you will see in the end of the lectures; this spirit can't dissolve all the colcothar; a few drops in sack kills the worms, and corroborates; some chymists said there was a medical gold, and call'd this tincture an *aurum potabile medicatum*, Tachenius, Valentini &c.

PROCESS CLXVII.

Iron dissolv'd in Rhenish wine.

PREPARATION.

To two ounces of fresh filings of iron, pour on 24 ounces of *Rhenish* wine, digest them in 200° of heat in our wooden furnace for three or four days, shaking 'em often; let them stand for 24 hours, decant the black wine, 'tis styptic and atramentous; you may pour on more wine, but 'twill not be so strong.

Its Uses.

We see a gentle acid of the vegetable kind dissolves iron; 'tis strengthning and makes good blood, and is good in cold constitutions; but 'tis hurtful where the solids are too rigid, or the fluids too thin: I've often thought this was the sulphur of metals so much boasted of; 'tis better than all the *aurum potable's*; a dram of this wine mix'd with three parts of sugar, is excellent good for children and maids.

PROCESS CLXVIII.

Iron dissolv'd in vinegar.

PREPARATION.

Boil an ounce of steel filings in 20 ounces of strong vinegar for 24 hours in our wooden furnace, then let them cool and settle; strain this red tincture, it tinges the glasses that hold it; we may repeat this operation with fresh vinegar, but a small quantity will be got from it.

Its Uses.

We see how easily steel is dissolv'd in acids; this tincture is styptic, corroborating, and anti-helminthic; 'tis better by sugar; how easily does iron enter the body when 'tis dissolv'd, and mix with the humors; *Lister* says 'tis apt to breed the stone.

P R O C E S S CLXIX.

Sublimation of iron with salt-armoniac.

P R E P A R A T I O N.

Take fresh filings of steel and flowers of salt armoniac, of each four ounces, powder 'em in a mortar, a volatile smell arises; put 'em into a glass cucurbit, clap an alembick to it, lute with common glue of paste; clap to a recipient, distill with a sand-heat of 200 degrees, you get a volatile liquor; encrease the fire, you get a salt of various colours; proceed thus for six or eight hours, let all cool; take out from the receiver the golden liquor, and from the beak of the alembick the party-colour'd salt, put 'em into a vial and stop all close; if it melts 'tis call'd *oleum ferri per deliquium*, if 'tis dry the flower of iron; at the bottom of the cucurbit is a reddish matter of an austere taste, which presently runs *per deliquium*, and is an *oleum martis per deliquium*; when this is expos'd to the air it swells as if it fermented.

Its Uses.

Here is a salt armoniac, which is an acid and alkali, united with iron; this salt lifts up the iron easily, the fixt part of the iron remains behind whilst the other mounts; hence iron is divided into

into fixt and volatile ; hence appears the volatility of salt armoniac ; hence philosophers call'd it the *avis rapax*, and *aquila alba*, which unlocks metals ; this resembles the *ens veneris* of Boyle ; 'tis restoring, healing, opening, seminarcotic, anodyne, and the dregs at bottom, united with alcohol, do give a tincture as well as the dry flowers : Those who are curious and patient, dissolve the remaining iron and salt in the air, then they coagulate and inspissate, thus they extract the virtue of the metal ; hence the rule, dissolve and coagulate ; can we think they will get mercury from this iron ? I have not yet found it ; however, salt armoniac is useful in the experiments of metals.

PROCESS CLXX.

Tricks with sulphur and iron.

PREPARATION.

Take the filings of iron and flowers of brimstone, powder them very fine in a mortar, the more the better, they grow hot and smell ; then boil this fine powder in water for half an hour, pour out and strain this water ; repeat this decocting, gather all the waters, inspissate, they contain a vitriol of iron. Boil eight ounces of iron and sulphur in water, make a paste, compress this strongly into a pipkin ; set it aside, it begins presently to heat, send out steams, and at last flames ; as soon as it has cool'd, powder the mass, boil it in water, and you get a *vitriolum martis* ; put an iron rod into sulphur melted upon the fire, it will crumble, and you get a calx of iron ; or put sulphur to any iron that is red-hot, and the iron melts into a calx.

Their Uses.

The acid fixes upon the metal, and in the action the sulphur is inflam'd; by fixing upon the metal it makes a vitriol; in this manner are made the acidulæ; these croci are aperient, whilst other acids fixing upon the metals are astringent. You see, my hearers, the various ways this metal is chang'd, and various changes happen upon various metals.

P R O C E S S CLXXI.

Lead made into calx by the steam of vinegar.

P R E P A R A T I O N.

Place lead in the alembick, put it upon the cucurbit in which I place vinegar, join them, put 'em into a sand-heat, join a recipient, distill the vinegar for 12 hours, let 'em cool; the plates of lead in the alembick grow white, take off this white powder with a hare's-foot, 'tis call'd cerufs, which is insipid and without smell; the steam of the vinegar is the vinegar of lead.

Its Uses.

You see how lead is dissolv'd into a powder by vinegar, the vinegar distill'd is the true sort of lead; this operation in the air succeeds the more the air is acid; the same Process will dissolve iron and copper into a rubigo and verdigrease; this cerufs is acid and metal, and is very astringent in ulcers; this powder receiv'd into the lungs is bad in asthma's, and makes people asthmatic; if it be taken by the mouth it raises oppressions and death, as appears in those who make cerufs; you see how easily the metal changes into a calx

Mel

Melt lead, it looks like quicksilver; from its surface you take off its calx, and thus the lead will all melt away into scum and calx, which is poisonous; by long calcination it becomes red; copper by calcination sends forth such a scum, which, according to its colour, is call'd litharge of gold or silver; the *Plumbago* is only the vein of lead, and differs not from the former, 'tis dissolv'd with the same things, and you get *sacch-saturni*, ceruss, red-lead, as well from the one as the other, they dry alike, and are poisons alike; red-lead grows heavy by the fire, whether by the acid or the fire, see *Boyle* of powders of flame.

P R O C E S S CLXXII.

The vinegar of lead.

P R E P A R A T I O N.

Boil ceruss in 20 times its quantity of distill'd vinegar, in a glass on our wooden furnace, for four hours, shaking 'em often, let 'em cool, decant; repeat this operation with fresh spirit till it becomes without sweetness; mix these styptick liquors together, 'tis call'd the vinegar of lead, or *lac virginale*, because it cures pimples; strain and distill to 1/4th, an insipid liquor comes off, the acid remains at bottom, whether we make ceruss, the lithargies, the red-lead, or the plumbago, the same effects are produc'd; boil this liquor with fresh vinegar, the insipid parts come off, and leave a saccharine acid at bottom, of the thickness of honey, call'd *oleum saturni*; the oftner we boil with fresh, the fatter is the liquor.

Its

Its Uses.

Here is a fresh manner of uniting metal to acid ; this vinegar resists putrefaction, preserves bodies long uncorrupted that are immersed in it ; it coagulates the humours, keeps them uncorrupted, cures pustules and red faces, makes the skin white, but brings on consumptions ; this join'd with oil of roses is balsamick, much commended by surgeons. (a)

P R O C E S S CLXXIII.

Salt of lead with vinegar.

P R E P A R A T I O N.

1st, Inspissate the vinegar of lead in a glass cucurbit till it grows as thick as oil, set it in a cool place, and you have crystals which are call'd sugar of lead. 2^{dly}, Dissolve this sugar in fresh spirit of vinegar, let it settle, inspissate to the thickness of an oil, set it in a cool place, and it exactly resembles sugar, and has a sugary taste. 3^{dly}, Repeat this operation, the liquor can hardly be dry'd, and melts like wax with a small heat ; the oftener this is repeated, the more fixt is it, and the more fluxil, and the crystals look like silver, which a certain loyalist expos'd to the publick for a secret: *Phil. Transf. abridg'd*, 3 *T. p.* 325. 4^{thly}, When this is expos'd to heat, it melts again, and by another inspissation throwing away the fœces with a gentle fire, it looks like silver. See *Isaac Holland*.

(a) This liquor may be that which *Ruyfch* us'd to preserve his bodies in ; and this mixture with the oil of roses is an *unguentum nutritum*.

Its

Its Uses.

This is fugar, salt, magistery or vitriol of lead, 'tis the metal and acid combin'd, 'tis astringent and coagulates the blood dissolv'd in water, 'tis the vinegar of litharge, good externally in inflammations; internally for hæmmorrhages, gonnorrhœas and whites, but I never durst venture it, because 'tis poisonous; if the fugar of lead be distill'd you get an inflammable spirit, and at the bottom you have a glass, which carries off all metals but silver and gold.

P R O C E S S CLXXIV.

Salt of lead with spirit of nitre, or aqua fortis.

P R E P A R A T I O N.

Put one ounce of lead in small pieces, or ceruss, or litharge, or red, into a high glass, pour on 15 ounces of spirit of nitre, diluted with ten times the quantity of water; when the effervescence is over, put them on our wooden furnace to boil for five or six hours; let them cool, decant, distill (or evaporate) to a pellicule, set them to cool and crystallise; if to this salt you pour on fresh *aqua fortis*, to dissolve it and inspissate again, you gain an oil of lead, which flows on the fire like wax; throw it into the fire, it does not flame as silver with spirit of nitre, but spits and flies about like shot, but powder'd finely it may be melted.

Its Uses.

It is more astringent than the former, it is a sweet styptick glass.

P R O-

PROCESS CLXXV.

Salt of lead treated with alcali's.

PREPARATION.

Take two ounces of salt of lead 173, 174, finely dry'd and powder'd, oil of tartar, four ounces, digest, the longer the better; then add one ounce of salt armoniac, digest again, this being done twice or thrice, dry and expose it to run; dry again, and distill from a loricated glass retort, in a sand-heat, you get waters, and at bottom somewhat much chang'd.

Its Use.

We see by this preparation the metal separated from every thing but mercury (b).

PROCESS CLXXVI.

Calx of the vitriol of lead.

PREPARATION.

Dry the salt of lead on a fire, powder it finely, put it into a pipkin plaster'd over, stir with a tobacco-pipe, you have an insipid calx.

Its Use.

This rids the salt of its acid.

(b) We see in short an experiment without head or tail, of no use.

P R O-

P R O C E S S CLXXVII.

Balsam of lead with vegetable express'd oils.

P R E P A R A T I O N.

Put lead in any shape, whether calx, litharge, &c. into a plaister'd pipkin, and twice its weight of any oil, put it on a fire, the lead melts before the oil boils; and disappears in the oil, when it boils; and makes a balsam.

Its Uses.

It strengthens the parts it is apply'd to, it makes vessels, &c. hold water; be careful by this Process, how we pronounce of the contents of bodies, for who wou'd think lead wou'd dissolve in oil?

P R O C E S S CLXXVIII.

Balsam of lead with distill'd vegetable oil.

P R E P A R A T I O N.

Dry sugar of lead of 173, pour on this powder'd fourfold as much ethereal oil of Turpentine in a high glass, boil, the lead dissolves and the balsam is made.

Its Uses.

As in the last.

P R O-

P R O C E S S CLXXIX.

Glass of lead.

P R E P A R A T I O N.

Take two pound of red lead, and one pound of sand, powder 'em finely, put 'em in a crucible till they flow, and till they stick like glass to a tobacco-pipe, and this is a yellow, pellucid, fusible, brittle, insipid glass of lead; this passes thro' all vessels, as water thro' a sponge; it turns all metals but gold and silver into glass, some add nitre of sea-salt to make the fusion the quicker; if sugar of lead put into a crucible, gently encreasing the fire, it also turns into a yellow glass; nay lead itself long melted will turn into glass; or take red lead four pound, sea-salt decrepitated two pound, sand one pound, mix 'em well, put 'em in a crucible till all flow, the salts will be at top and the glass at bottom, all these glasses mix'd with charcoal and fus'd, become lead again.

Its Uses.

We see a ductile metal chang'd into brittle glass, and we see how 'tis reviv'd; when sulphureous parts are taken away, metals and minerals are turn'd into glass, as appears in antimony, and these sulphurs being return'd, the metal and minerals return; see *mem. ac. R.* 1709. p. 218. This glass melted with metals, makes all fly off, except gold and silver, take care of the fumes of lead, for they are poisonous.

P R O

PROCESS CLXXX.

A solution of silver in spirit of nitre or aqua fortis.

PREPARATION.

Take an ounce of granulated silver, put it into a urinal, add 2 ounces of *aqua fortis*, very strong, when they have done effervescing and the silver is dissolv'd, the liquor is pellucid and extremely caustic, decant; spirit of nitre will do as well as *aqua fortis*.

Its Uses.

Granulated silver is made with one part silver and 10 of lead, melted and pour'd into cold water, where it turns into powder; there is generally a black dreg that settles to the bottom after the solution of the silver, and this is gold; if any salt of fountains, as *Gem*, of the sea, or armoniac, be in the *aqua fortis*, it turns *aqua reg.* and will not dissolve the silver; if the liquor be green it has copper in it; one drop of this liquor burns the flesh in an instant, and is good to take off warts, small cancers, callous lips of ulcers, &c. drop the solution into waters; if there be any sea-salt in it, the silver precipitates; this caustic makes the parts black; we see silver suspended in the liquid; the taste of it is vastly bitter.

PROCESS CLXXXI.

Vitriol of silver.

PREPARATION.

Pour into the aforesaid liquor a small quantity of the filings of silver, this continue to do till 'twill dissolve

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dissolve no more, set it in a coal place and you get the crystals; or if you should evaporate the liquor to 1 10th and set it in a cool place, you have the crystals; these crystals are caustic, and will burn at a touch into a black eschar.

P R O C E S S CXXXII.

The lunar caustic, or lapis infernalis.

P R E P A R A T I O N.

Pour the former crystals into an urinal, cut at bottom, put this piece of glass boldly upon the fire; when they have done fuming, pour 'em into a conical mold made of potter's-clay; when the crystals are cold, take 'em out by breaking the molds, and dry 'em on paper; this is the caustic stone.

Its Uses.

This is the strongest part of the acid, join'd to the silver, for the water fumes off; this will dissolve in water; add a little filings of copper to it, and you may recover the silver; 'tis a most powerful caustic and takes off fungus's the best of any, 'tis the strongest of poisons.

P R O C E S S CLXXXIII.

Angelus sala, or Boyle's Hydragogue of silver.

P R E P A R A T I O N.

Dissolve an ounce of nitre in water, then take the crystals of silver of 181, No. 1. one ounce, dilute this in three parts of water, mix these liquors together; put these in an urinal, upon a clear fire.

fire, exhale to a pellicule, set 'em in a cool place to crySTALLISE, dry this mass gently; then take the hollow part of an urinal cut off at bottom, put these crystals in it, let 'em dry before the fire, stirring 'em that all may be equally heated, do this till no more steam arises.

Its Uses.

This is a purging silver; if you would discover a fraud some use, to wit, by pouring this nitre on equal parts of melted lead, and so making you believe that they converted the lead into a 10th part silver, put in copper, all the silver precipitates; powder the mass, 'tis bitter and somewhat caustick, two grains of it in paste with sugar purge strongly; it kills worms of all kinds, dropsies, inveterate ulcers; *Rob* of juniper-berries corrects it; have a care how you dose it.

P R O C E S S CLXXXIV.

Burning silver.

P R E P A R A T I O N.

Take a *Holland's* turf that is so much on fire as it does not smoke, place this horizontally, make a hollow in the middle of it, put on a little of the *lapis infernalis*, and it will flame and sparkle, the silver is left at bottom.

Its Uses.

Thus we see that the acids are banish'd and the metal returns; thus we see silver may be made potable; thus also we see that the nitre is still inflammable. (c)

(c) Spirit of nitre itself is not inflammable, but if mix'd with any oily body 'twill presently flame; therefore the nitre must have acquir'd some fine sulphureous parts from the silver.

P R O C E S S C L X X X V .

The reduction of silver from spirit of nitre.

P R E P A R A T I O N .

Put into silver dissolv'd in spirit of nitre and that diluted well with distill'd water, 20 times its quantity of plates of brass well polish'd; these plates will attract the acid, a powder will subside, and the water will grow green, the shining powder is the silver.

Its Uses.

This is a ready way of pulverising silver, and it presently makes an amalgam with quicksilver; melt this powder in a crucible and the silver returns; if you view this liquor with a microscope, you see the globules of silver, pointed with the acid, run to the copper; hence copper attracts the acid stronger than the silver, hence this powder is made.

P R O C E S S C L X X X V I .

Luna Cornea.

P R E P A R A T I O N .

1st, To the solution in Process 181, N^o. 1. dissolved in four times its quantity of pure water drop in a little lime, the liquor grows immediately whitish and thick, without any effervescence when the liquor is no more disturb'd with lime pour it off, and gather the white thickish matter at bottom; to this matter thus precipitated pour in hot water till it grows insipid, then boil the matter in water, shake the glass, then filter it, and it upon the filter; this is the calx of silver.

Melt this in a crucible, pour it upon a marble, 'tis a shining, brown, brittle, and somewhat tenacious matter, hence 'tis call'd *Cornea*; 'tis silver united to the spirit of nitre and sea-salt; if you endeavour to expel the spirits upon the fire, great part of it flies off, nor does the remainder turn into silver: If one p. of silver, calcin'd by 185th Process, mix'd with two p. of sublimate mercury, distill from a retort in a sand-heat, and the *Luna Cornea* is at bottom; or if instead of salt you use its spirit, or also if you precipitate the silver with oil of vitriol, in either case you will have the *Luna Cornea*.

Its Uses.

We see how the salt precipitates the silver, for salt with spirit of nitre makes an *aqua regia*, therefore it lets go the silver; if with two p. of the calx of silver you mix one p. of regulus of antimony, and mix 'em well, putting 'em into a retort and distilling from a sand-heat, you get the butter of antimony, and the silver remains at bottom with part of the regulus, and being reduc'd always gives true gold (d); hence we are certain that the weight which accrues to the calx of silver, is owing to the *aqua regia*; who would believe so insipid a body as *Luna Cornea* contain'd one fifth of a most corrosive acid? (e) how does *sal-marine* act upon metals, and yet is return'd? hence 'tis plain how gold may be discover'd in bodies it was not suppos'd to be in: How did *Homborg*, by the assistance of tartar, quick lime,

(d) That is, the acid joins in with the sulphur of *antimony* and gives a butter; whilst the *aqua regia* dissolves the gold in it and precipitates the silver.

(e) No more wonder, than that so cool a body as nitre contains so corroding a spirit,

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salt-armoniac, and the white of an egg, draw out of half a pound of silver three drams and 50 grains of true quicksilver? this *Luna Cornea* is not dissolv'd in *aqua regia*, *aqua fortis*, nor the fire.

P R O C E S S CLXXXVII.

Tin dissolv'd in aqua regia.

P R E P A R A T I O N.

Put *aqua regia* in an urinal, throw in pieces of tin till all is dissolv'd, and the commotion is over; dilute this with 20 times as much water, the tin precipitates, wash it with warm water, and this white powder is call'd the magistery of tin. *Tin dissolv'd in aqua fortis* effervesces, and makes a sort of soap, like the white of an egg. The magistery spoke of is good in hysteric and hypochondriac cases, but there are safer things; mix'd up with pomatum 'tis an excellent cosmetic; this magistery is hardly meltable into tin again: Tin requires the least quantity of acid to dissolve it of all other metals; tin thus dissolv'd does not smoke, but mix this calx with twice as much mercury sublimed and distill from a retort, the liquor that comes forth always smokes.

P R O C E S S CLXXXVIII.

A solution of copper in distill'd vinegar.

P R E P A R A T I O N.

If you put copper plates at the top of an alembick, and heat 'em, as was said above, on lead the metal will be thus dissolv'd, and the liquor distill'd and thicken'd by the fire becomes green.

one drop of which is emetick the plates being dried, a verdigrease, which is commonly made at *Montpelier*, by the rasins press'd on copper plates; if you boil verdigrease in spirit of vinegar till it refuses any more to be ting'd, a great deal of indissolveable matter remains at bottom, which shews the brass corroded is not verdigrease; if you inspissate too much, the crystals grow black.

Its Uses.

This shews how copper is dissolv'd with acids; copper easily grows green by acids; these crystals are emetic, cathartic, and cathartic in ulcers. *Pro. 53.*

P R O C E S S CLXXXIX.

A solution of copper in salt armoniac.

P R E P A R A T I O N.

To one pound of the filings of copper add three pound of salt armoniac, and pour on four pound of clear water, mix 'em together; dry this part in a glass cucurbit cut off in a moderate fire; repeat this solution and exsiccation often, then boil in water, strain, inspissate, you have a blue tincture, and you may crystallise.

Its Uses.

This is a famous antiepileptic liquor for children, a few drops given in mead fasting, it purges 'em gently, kills worms.

PROCESS CXC.

A solution of copper in aqua fortis.

PREPARATION.

Pour on *aqua fortis* or spirit of nitre to filings of copper, an effervescence follows, and the liquor grows green; do this till it grows no longer green, strain, and inspissate to half.

Its Uses.

The least quantity of this is emetic, kills all insects, as fleas and all sorts of lice, &c.

PROCESS CXCI.

A solution of copper in aqua regia.

PREPARATION.

Proceed as in the last.

Its Uses.

Observation alone shews what will, and what will not dissolve.

PROCESS CXCI.

A solution of copper in volatile alcali.

PREPARATION.

To one dram of filings of copper put 12 of spirit of salt armoniac, shake 'em often, you have fine blue tincture; or if you moisten the filings with oil of tartar three p. digest, dry, boil, strain and inspissate, you have the same liquor.

Its Uses.

The dose is from three, doubling the dose every day, to 24 drops, in mead, and continue in this last dose for some days; 'tis a good aperient, attenuant, warming, and most diuretic liquor: I cur'd a confirm'd ascites by this, the water flow'd as from a cock, but fail'd in another, which shews the fallibility of methods; 'tis good in cold diseases: Copper is easily dissolv'd in any acid, even in express'd and distill'd oils it gives a greenness.

P R O C E S S CXCIII.

The depuration of mercury.

P R E P A R A T I O N.

Strain mercury thro' leather, and whatever is faculent is left behind; or distill mercury from a retort in a sand-heat into a recipient where there is water; or distill it with quick-lime from a retort on a sand-heat.

Its Uses.

These are the common methods of purifying quicksilver, and you see by this how volatile 'tis.

P R O C E S S CXCIV.

A solution of quicksilver in aqua fortis.

P R E P A R A T I O N.

Take four ounces of pure quicksilver, put it into an urinal with six ounces of *aqua fortis*; put 'em upon the fire till the mercury is dissolv'd,

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the liquor is pellucid and the taste horridly austere; thus we see a body so much more ponderous than *aqua fortis* is yet to be dissolv'd in it; the quicksilver is only divided, not chang'd, so that in every drop of the liquor there is a proportion of the mercury; this solution is intractably caustic; hence it takes off warts, it makes the skin purple; *aqua regia* and spirit of salt do not readily dissolve quicksilver; yet mercury sublimate is a true salt of mercury dissolv'd by these spirits, and pour on salt of tartar to sublimate water, you regain a sea-salt; the precipitate may be dissolv'd in *aqua regia*, 'tis sublim'd only by sea-salt into a mercurial salt.

P R O C E S S CXCIV.

Vitriol of quicksilver.

P R E P A R A T I O N.

First, when you have dissolv'd so much quicksilver in *aqua fortis* as it will dissolve no more, then it precipitates white at bottom; pour off this liquor, and a most intractable acrimonious salt, soluble in water, remains at bottom; if the remaining liquor be inspissated to half and set to cool, you have crystals; but if you take one part of quicksilver, two pound of salt decrepitated, and powder them finely, put 'em into a glass cucurbit and give a strong fire, you get mercury sublimate, which is a true vitriol.

Its Uses.

Quicksilver is made an imperfect vitriol by spirit of nitre, as well as a fixt one; whereas by spirit of salt 'tis a perfect and volatile one; its acrimony is from the spirit of salt.

P R O-

PROCESS CXCVI.

White precipitate mercury.

PREPARATION.

Pour on to the solution of mercury in spirit of nitre two pound of water, to this pour on brine till no more white powder will precipitate; decant the liquor, and filter the powder till 'tis dry, wash this with warm water frequently till 'tis tasteless.

Its Uses.

The salt water and the spirit of nitre make an *aqua regia*, and as mercury is not easily dissolv'd in this, it falls down. This powder is an acid and quicksilver united; it may be given internally, and being powder'd with sugar it makes a panacea, which given to nine grains fasting in adults it vomits, purges, kills the worms, and so cures scabs, venereal ulcers, and a gonorrhoea; this dose often repeated raises a salivation; mix'd with pomatum it cures ulcers and scabs; if you calcine it upon the fire in a glass, it neither vomits, purges, nor salivates, but proves diaphoretic and alterative; rub this powder upon brass, it silvers it.

PROCESS CXCVII.

Red precipitate mercury.

PREPARATION.

1st, Take the solution of mercury in 194, a pound and half, put it in a large glass retort, fit a recipient, distill with a gentle fire from our wooden

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wooden furnace so that the liquor never boil, at bottom you have a dry, white, most corroding matter, at the sides of the retort somewhat red; then place the retort in a sand-heat, fit to it a large recipient, distill gently till red fumes appear; change your recipient, fit another, distill till all the red spirit of nitre is come out; at the bottom of the retort will be the red powder, and a parti-colour'd one all about the retort, keep the red one apart. 3dly, Chymists have repeated this work in hopes of finding gold: *Paracelsus* advises it, and *Sylvius* in his posthumous works affirms it.

Its Uses.

This is *Vigo's* red precipitate, which is corroding, and produces eschars; 'tis dangerous to give it internally, because it vomits, and corrodes the bowels; three grains, however, are as much as can be given; it may be made milder by firing alcohol upon it, or distilling it with the whites of eggs or vinegar, but to what purpose? when we have the white precipitate, which is milder; by calcining it in a glass over the fire, it becomes so mild as hardly to act: Let mercury be prepar'd any how with acids, add quick lime, distill, you regain the mercury.

P R O C E S S CXC.

Mercury sublimate.

P R E P A R A T I O N.

Inspissate the solution of 194 into a dry white mass, take this powder and add 10 p. of decrepitated salt, and as much of vitriol calcin'd to a whiteness; powder all these well apart, then mix 'em, put 'em into a glass vial, fill it 1 3d full, put it

it into a sand-heat, give a gentle fire, take care of the fumes, then close up the glass with paper, encrease the fire, and you have the white crystals, which separate.

Its Uses.

This mercury has *aqua fortis* in it, 'tis a true vitriol of quicksilver, 'tis very corrosive, and makes an eschar; it consumes callus's, ulcers, warts, and indurated glands; it makes up *Vigo's* troches of minium; a grain of it in an ounce of water is a cosmetic; it kills all insects; it may be given internally, mix'd with syrup of violets, but be very wary what you do; by the assistance of it and silver, some gold may be found; see Process 186. We see how *aqua regia* dissolves mercury when it has first been dissolv'd in *aqua fortis*, how spirit of salt makes it volatile when nitre had fix'd it.

PROCESS CXCIX.

Turbith of mercury.

PREPARATION.

1st, To four ounces of quicksilver, put into an urinal eight ounces of oil of vitriol; put 'em upon the fire, being warm'd put it upon live coals, and boil 'em till the whole mercury is dissolv'd into a white mass and dry; take care of the steams. 2^{dly}, Powder this finely in a glass mortar, throw it into 20 times its quantity of warm water in a glass, it presently grows yellow, shake it often, then let it settle, decant, wash the remaining powder in warm water often; this is call'd *Turbith mineral*. 3^{dly}, Let this liquor decanted be strain'd, and inspissate to 1 6th; this is mercurial

mercurial water, and by adding oil of tartar you get a red precipitate.

Its Uses.

You see how the variety of acids changes the colours of the mercury; if this white powder be expos'd to the air, it grows of a citron colour; and 'tis that powder which *Paracelsus* did wonders with; burning spirit of wine upon them, it mitigates it; *Sydenham* commends it highly in the pox; *Boyle* says it dissolves catarracts, 'tis good in dropfies; *Helmont* means this when he advises *Vigo's* powder to be prepar'd with the fire vitriol of *Venus*, by which he means oil of vitriol; distill the white of an egg from this powder, it renders it milder: Metals act upon us by their powders, bulk, and figure; and salts making 'em vitriols, cause 'em to act violently, calcination taking off those salts, abates their force; the manner of taking off these acids is by washing with water, by distilling to a driness, by kindling spirit of wine upon them, or distilling it from them, by mixing more metal with 'em, as in the preparation of *Mercurius dulcis*, by alkaline salts, by testaceous powders, and by calcination with a strong fire.

P R O C E S S C C.

The fiery oil of mercury.

P R E P A R A T I O N.

To the last preparation, I mean the white powder, pour on equal quantities of oil of vitriol, boil to a driness, avoiding the fumes; when 'tis dry pour on more oil of vitriol, till it will dry no more, but stands like an oil.

Its

Its Uses.

This is the inceration and saturation of metals, you may regain the mercury from this by distilling from the filings of iron.

PROCESS CCI.

Æthiops mineral.

PREPARATION.

Take one dram of flowers of sulphur, three drams of mercury, rub 'em well in a mortar till the mercury disappears, and you get a black mass.

Its Uses.

We see how easily sulphur unites with mercury; this powder never enters the lacteals, it raises no salivation because it never enters the blood; it kills the worms in the bowels, and I don't think it safe for children. (e)

PROCESS CCII.

Fætiticus Cinnabar.

PREPARATION.

Take flowers of sulphur, four ounces, let it melt on the fire, then take quicksilver warm'd, put it into the sulphur, stirring it about, 12 ounces; you have then a black mass, the matter be-

(e) That it does not enter the blood, or that it has appear'd in ulcers in its proper shape, are two assertions equally true; but that it will not salivate, especially as 'tis here made, is a mistake that every common practitioner can contradict with truth.

ing

ing set on fire, put this into a retort, lute a recipient, distill from a sand-heat, encreasing the fire to the last degree. 1st, An insipid water arises, then white flowers, then somewhat black, let all cool; this black by powdering becomes a cinnabar; at the bottom of the retort there remains some feculency, this cinnabar don't differ from *Æthiops*, 'tis *Crato's* great antiepileptic; I have never seen many good effects from it; if join'd with cathartics, it passes the bowels, mix'd with pomatum 'tis a red cosmetic, it has been us'd for ulcers in the nose and mouths of venereal persons with little or bad success, the mercury may be recover'd by mixing it with iron filings and calling it over the helm.

P R O C E S S CCIII.

An amalgam of mercury with lead and other metals.

P R E P A R A T I O N.

Melt lead in an iron spoon, put to it an equal quantity of quicksilver warm'd, stir 'em and it becomes a hard mass like silver, but by rubbing grows soft; put this mass into a glass mortar, rub it fine, add as much mercury as you please, it will mix with water like salt; tin may be managed in the same manner in every respect; if also to copper dissolv'd in *aqua fortis* and diluted with 12 times its quantity of water, and to this liquor heated, you put in plates of iron finely polish'd, the copper precipitates, wash this precipitate with warm water till it grows insipid; to this powder well dried, put mercury, equal p. and you have an amalgam, which by adding more mercury will also dissolve in water like salt; 'tis a difficult matter,

ter to make salt amalgamate any other way. 4. Silver will amalgamate after this manner. 5. Dissolve gold in *aqua regia* till it will dissolve no more, dilute this with 12 times its quantity of water, throw into it plates of copper well polish'd, keep it in a proper warmth till all is settled, pour off the liquor, wash the powder, dry it, mix it in a glass mortar with quicksilver; this is an amalgam which also can be dissolv'd in water; or make from gold and silver depurated by lead a separation of the silver by *aqua fortis*, the gold settles black at the bottom, this black powder being dried, mix'd with silver, makes an amalgam.

Its Uses.

All amalgams are white, by these methods you may make amalgams from every metal but iron; hence we see mercury dissolves metals, this amalgam is a good way to hide metals, tho' the deceit is easily found; the first fumes of lead coagulate mercury, the mercury easily ascends and leaves all metals behind it, the use of these amalgams is for silvering and gilding.

P R O C E S S CCIV.

The ablution of metals by mercury.

P R E P A R A T I O N.

Take any amalgam, rub it well in a mortar, pour on water, it grows black; pour on and off the water in this manner till the amalgam looks as white as silver, this black powder is neither metal nor mercury.

Its

Its Uses.

What this powder is, I hope to speak of hereafter.

P R O C E S S C C V.

Solution of gold.

P R E P A R A T I O N.

Take *aqua regia*, pour into it one p. of pure gold, put 'em upon the fire in an urinal, that the gold may dissolve; put in so much as the spirit will dissolve, the liquor becomes of a golden colour; if any black subsides to the bottom, 'tis silver.

Its Uses.

This is a caustic liquor, it dyes the skin purple, 'tis a poison; put in any fixt or volatile salt, the gold falls to the bottom, decant and wash this powder with water, dry with a heat of 80° ; this powder is heavier than the gold put in; put the powder in any thing upon the fire, it flies off with a crack, and is call'd *Aurum fulminans*, which I don't know how to explain, some have sav'd this powder by letting it explode in a glass bell, notwithstanding the great promises from the use of this powder, it raises violent pains.

Fourthly,

Fourthly, on SEMIMETALS.

First, on SALINES.

PROCESS CCVI.

The analysis of vitriol into spirit, oil, and colcothar.

PREPARATION.

First, Take eight pounds of green vitriol, put them into earthen jugs, place 'em on a fire till all the steams go off, and the matter grow red, thus is the vitriol calcin'd; the Jugs will be broke; powder this calcin'd matter, of which you have lost three pounds, put it into an earthen retort, fix a recipient to it, lute it with marl and lime, let the lute dry, observe all the cautions in 141, 144; continue the fire for six hours, continue distilling till the retort is red hot, 18 hours are sufficient; then carefully take off, when all is cool, the recipient with the oil in it; from this quantity you generally have 21 of oil; in the retort there was 2 ounces of colcothar, so that five ounces were lost. (f)

Its Uses.

Thus we have the oil and spirit of vitriol of great use in physick, the oil does not boil unless at 600 degrees of heat, and it parts with its spirit and water in 500°; and becomes most ponderous

(f) *N. B.* The author does not immediately join the recipient to the retort, but uses a cylindrical tube, one part of which unites to the recipient, the other to the retort with his

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What this powder is, I hope to speak of hereafter.

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Solution of gold.

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First, Take eight pounds of green vitriol, put 'em into earthen jugs, place 'em on a fire till all the steams go off, and the matter grow red, thus is the vitriol calcin'd; the Jugs will be broke; powder this calcin'd matter, of which you have lost three pounds, put it into an earthen retort; fix a recipient to it, lute it with marl and lime, let the lute dry, observe all the cautions in 141, 144; continue the fire for six hours, continue distilling till the retort is red hot, 18 hours are sufficient; then carefully take off, when all is cool, the recipient with the oil in it; from this quantity I generally have 21 of oil; in the retort there was 52 ounces of colcothar, so that five ounces were lost. (f)

Its Uses.

Thus we have the oil and spirit of vitriol of great use in physick, the oil does not boil unless in 600 degrees of heat, and it parts with its spirit and water in 500°; and becomes most ponderous

(f) N. B. The author does not immediately join the recipient and the retort, but uses a cylindrical tube, one part of which unites to the recipient, the other to the retort with his

and fiery, and put into water it effervesces strongly; if you distill this oil from a sand heat, so that the drops follow one another in 6 seconds, and, receiv'd into water, you have a pure oil, every drop that falls into the water makes it hiss like fire, and if it falls upon glass, when hot, it splits it like a diamond; take your fire down, melt your glass, or you may rectify it upon its fœces.

P R O C E S S CCVII.

Ens veneris.

P R E P A R A T I O N.

Boil colcothar in water, strain it, it has the taste of vitriol, boil and strain so long as it tastes vitriolic, keep the calx. 2dly, Take this calx and flowers of salt armoniac dry'd, mix 'em well in a mortar, take care they don't grow moist, put 'em into a cucurbit, fit to it an alembic, first comes off a volatile yellow liquor, encreasing the fire, you have the *ens veneris*, yellow; let all cool, and take off this powder, at bottom will be found a red matter, which will swell in the air (g).

Its Uses.

You see how metals will be elevated with salts a grain of this put into the infusion of galls turns black, *Boyle* commends it highly for the rickets and other diseases.

(g) See Process 169. which is the same.

Second

Secondly, SULPHUREOUS SEMI-METALS.

PROCESS CCVIII.

Solution of antimony in aqua regia.

PREPARATION.

Powder fine antimony a pound, pour to it of *aqua regia* ℥jss, as they effervesce greatly, take care of the steams, at bottom is found an ash-colour'd yellowish matter, which dries.

Its Uses.

This is a moist calcination of antimony, thus antimony acquires most virulent properties; this puls is the sulphur of the antimony, so that the *aqua regia* calcines and also separates the *regulus*.

PROCESS CCIX.

True sulphur of antimony.

PREPARATION.

Take the calx of 208, wash it in water, shake it, pour it off and keep it apart; dry the powder at bottom, it has every mark of sulphur, but if you had put in a great quantity of *aqua regia*, the sulphur would become more visible.

Its Uses.

We see how sulphur lurks in metals and metallicks, and how the *aqua regia* secretes out the metal; this sulphur differs only from the common in as much as 'tis green.

P R O C E S S CCX.

Glass of antimony.

P R E P A R A T I O N.

First, Take antimony in fine powder 2 pound, put it into an unglaz'd pipkin, set it on the fire and calcine till it smoaks no more, take care of the steams. *2dly*, Put this calx into a crucible, cover the crucible with a brick, encrease the fire till all is melted, keep it in this condition for a quarter of an hour; pour it upon a marble and let it cool.

Its Uses.

We see by Process 209, that antimony has a sulphur, and by this Process that it has a metallic substance, which is emetick. I know not why only that by frequent infusions in wine, it loses its weight, this glass as lead consumes all metals except gold, whose colour it heightens.

P R O C E S S CCXI.

Regulus of antimony with salts.

P R E P A R A T I O N.

First, this is done by bare fusion, the sulphur is at top, and the metallic parts settle at bottom. *2dly*, Put two pound of nitre, three pound of tartar, and four pound of antimony, powdering them well, into a large crucible, gradually, so that one pound be thoroughly detonated before the other is put in; when all is done, let it continue till it flow like water; then presently put it into a metallic cone greas'd with candle-grease, you have at the top a sulphureous scum, and at bottom the regulus, streak'd like a star; the crucible must be large, a little must be thrown in; throw none in till the other is perfectly fix'd; without these cautions it will not do.

Its Uses.

By the laws of *Hydrostatics*, the heavier part subsides; here is the art of separating sulphur from the metal, so it is in other metals; the alcali's join with the sulphur, and the metal is set free at bottom; the alchymists are in admiration of this star, if you melt it afresh with alcali's, you have fresh sulphureous scum, neither do I know, whether it ever can be free of sulphur; the scum then is sulphur and alcali; hence may we understand its virtues, 'tis emetic as the glass is; we see how alcali's depurate metals.

P R O C E S S CCXII.

Regulus of antimony with iron and nitre.

P R E P A R A T I O N.

Take ℥ss of the filings of iron, heat 'em in a crucible, put in finely powder'd and dried antimony ℥j, keep 'em in the fire till they flow, then throw in gradually a quarter of a pound of nitre, keep 'em there till they flow like water; pour it out as before, you have the regulus, and the scum at top, which is harder than that before-mention'd.

Their Uses.

We see how the iron also attracts the sulphur; *Paracelsus* and *Alexander Scuthten* speak of this preparation.

P R O C E S S CCXIII.

The alchymistical regulus of antimony.

P R E P A R A T I O N.

Put into a crucible iron nails eight ounces, place them in a wind furnace; when they are fully set on fire throw in a pound of antimony finely powder'd, stir 'em about with a tobacco-pipe till the iron is melted, then throw in three ounces of nitre gradually, which must be very dry; when the detonation is over, let 'em stand till they run like water, pour it out, as before, you have eight ounces six drams of regulus, 11 ounces of scoria, therefore four ounces and two drams are lost in steam. 2. Put this regulus again into a crucible, when

when 'tis melted throw in three ounces of finely powder'd antimony, when all is melted throw in three ounces of nitre gradually, as before, keep 'em five minutes in fusion, pour 'em into a cone, you have 10 ounces six drams of regulus. 3. Put this regulus again into a crucible, melt it, throw in three ounces gradually of nitre powder'd, let 'em flow, pour 'em out into a cone, as before, you have nine ounces of regulus like silver, two ounces of scorixæ and seven drams, you have lost one ounce and five drams. 4. Put this regulus again into a crucible, melt it, pour in nitre three ounces gradually, let 'em flow for an hour, then you have seven ounces three drams of fine regulus like silver, and starry, two ounces seven drams of golden fiery tasted scorixæ. 5. The crucibles ought to be very large, the fire equally continued, the cones moderately warm, and anointed with candle-grease.

Its Uses.

Thus we observe that iron melts with antimony as other metals do with lead; the iron unites with the scorixæ, and the mercurial parts of the antimony settle to the bottom; the nitre agitates these sulphurs, and the regulus settles; the scorixæ has peculiar virtues, and swells in the air; the second and third fusion shew the metallic parts the better, and communicate an acrimonious taste to the scorixæ: See *Paracelsus, Scudten, Philaletha, Pantavion, Becher, and Stahl*. The regulus gives its colour to the gold; this regulus vomits, and the scorixæ communicate a tincture to alcohol. I ought to blush at the pains I have taken with antimony, but every one to his taste.

P R O C E S S CCXIV.

The golden sulphur of antimony.

P R E P A R A T I O N.

Boil the scorixæ of 212 in water till they be dissolv'd, pour on vinegar till no more is precipitated, let it settle, and decant; this precipitation raises a stinking smell; this golden sulphur must be often wash'd in water till it be nearly insipid; 'tis emetic.

P R O C E S S CCXV.

Crocus of antimony.

P R E P A R A T I O N.

Take equal parts of antimony and nitre, powder 'em fine, and heat them in an iron spoon, throw all gradually into a crucible, heat it till all is detonated, wash this whole matter with water, filter those waters, put on a little vinegar and the powder settles; thus you have a crocus: They deflagrate like gunpowder; the metallic part may be calcin'd into glass and scorixæ, and is violently emetic, as in Process 210.

P R O C E S S CCXVI.

A milder emetic of antimony.

P R E P A R A T I O N.

Take antimony 1 p. nitre 2 p. powder them, throw 'em into a crucible red-hot, let 'em detonate

tonate, wash 'em, and you have an insipid antimony, the water is salt; this gently moves vomiting; the water precipitates white with vinegar.

P R O C E S S CCXVII.

Diaphoretic antimony nitrated.

P R E P A R A T I O N.

Take antimony 1 p. nitre 3 p. powder them, throw them gradually into a red-hot crucible, taking care to let the last be heated before you throw in more; let them cool, you have a white powder.

Its Uses.

It raises no nausea, and may be safely taken to half a dram in acute cases; 'tis worse for washing, because we take off the nitre; antimony of itself is not emetic, nitre in equal parts makes it vomit; washing therefore makes it worse, by taking off part of what fixes it: Chymists repute it opening and diaphoretick, and that the arsenical poison of it is fix'd by the nitre; but before this fixing there was nothing emetic in antimony, but what the nitre made; hence *B. Valentine* would not be solicitous to get rid of the fixing nitre, for it does not nauseate but stimulate. (b)

(b) *N. B.* We can make antimony into sulphur; it fixes quicksilver, and makes æthiops as sulphur does; this sulphur may be made active, and it may be curb'd, as the operator judges most proper; the chymist must only adjust the salt.

PROCESS CCXVIII.

Common diaphoretic antimony.

PREPARATION.

If to the last Process finely powder'd you pour on boiling water, you clear the calx of the nitre.

Its Use.

I advise it only with purgatives, as in *pulv. Cornachinus*.

PROCESS CCXIX.

Nitre stibiated.

PREPARATION.

Exhale the water in the last preparation, perpetually stirring it, you have a white saline matter.

Its Uses.

This salt opens gently, is diaphoretic, diuretic, cooling, and of good use in the small-pox, measles, and inflammation of the lungs.

PROCESS CCXX.

The fixt sulphur of antimony.

PREPARATION.

To the nitrous liquor of 218 boiling hot, pour in spirit of vinegar, it grows milky; continue to do this till no more settles; decant the liquor and

and dry the powder; the acid precipitates the sulphur which the spirit of nitre had dissolv'd, without an effervescence.

Its Uses.

I believe 'tis of no use, but the vinegar along with the powder is antipestilential: Chymists are too profuse in the praise of all their preparations; however, this acetous, nitrous liquor is very useful in all febrile cases.

P R O C E S S CCXXI.

*The distillation of antimony into butter and cinna-
bar.*

P R E P A R A T I O N.

Powder two pound of sublimate very fine in a glass mortar, powder also a pound of the best antimony apart, mix them in a mortar, they grow hot; put them into a retort of a large bore, take care nothing stick to the neck of the retort; place them on a sand-heat, fit a glass recipient, cover the retort with sand, lute the recipient, encrease the fire by degrees; first comes over a liquor; encrease your fire, then comes a fatty, and gradually an icy matter; apply a live coal at a distance from the neck of the retort, and the butter melts into the recipient; when no more ascends remove this recipient, which stop up, carefully avoiding the steams; clap another recipient, and then comes up a reddish matter by encreasing the fire; take away the recipient, and in the neck of the retort is the cinabar; the retort contains the dregs of antimony; the fumes of this are caustic and dangerous for the lungs.

Its

Its Uses.

This butter is the acid that fixes upon the fine oil of the antimony, and the cinnabar is the mercury and the sulphur of it join'd together; this butter melts in heat, grows icy in cold, and precipitates in water into *mercurius vitæ*; if we had taken the regulus, we should have had the same phænomena, as to the butter; but then the mercury would run, because the gross sulphur is wanting.

P R O C E S S CCXXII.

Distillation of the butter of antimony into a liquid oil.

P R E P A R A T I O N.

Redistill this butter, you gain this oil, which grows more liquid by a third distillation; this oil is very caustic, and its steams are destructive; I knew an ingenious gentleman destroy'd by 'em: This experiment shews how to turn metals into a liquid oil, shews the power of sea-salt to make metals volatile, &c. (i)

(i) This is no more than what happens to all oils whatever, for the more they are expos'd to the fire, the thinner they grow, as in oil of wax, &c. the reguline part is divided so minutely by the fire, that 'tis suspended in every oil.

P R O C E S S CCXXIII.

Mercurius vitæ and its regulus.

P R E P A R A T I O N.

Drop butter or oil of antimony into water, it turns immediately into a white powder; wash this till 'tis insipid, dry it.

Its Uses.

The salts that held the regulus are attracted by the water, so that the powder settles; some have call'd this *mercurius mortis*; 'tis a violent emetic, given to two or three grains; 'tis said this powder put into a glass, and put on the fire and continually stirring it, loses all its virulency, and is *Riverius's* arcanum; this powder has nothing of mercury in it: I took this powder prepar'd by myself to 11 ounces, put it in a crucible, it melted as soon as the fire had thoroughly heated the crucible; I had 10 ounces of regulus a little ash-colour'd.

P R O C E S S CCXXIV.

The philosophical spirit of vitriol.

P R E P A R A T I O N.

Inspissate the water of the former preparation to one half, and you have this spirit.

Its Uses.

This is ill nam'd spirit of vitriol, for 'tis nothing but the spirit of salt reviv'd from the butter and the regulus: I distill'd this water, first I
got

got the water pure; then mounted somewhat subacid; and, lastly, the true spirit of salt.

P R O C E S S CCXXV.

Helmont's *flowers of antimony*.

P R E P A R A T I O N.

Take a pound of stibium dissolv'd in *aqua regia* as in 208; put it into a wide mouth'd glass upon the fire, continually stirring it till it be dry; powder this in a glass mortar with a glass pestle, then add equal quantities of dry salt armoniac; then powder them exactly, put 'em into a low broad-neck'd cucurbit, fit to it an alembic, lute with flower of linseed, place it upon a sand furnace, cover the cucurbit with sand to the very neck of the alembic, give a gentle fire, you have an acid water, then encrease your fire, so much as you can bear to touch the head of the alembic; then come up the flowers, let 'em cool, take off the alembic, avoiding the steams; take off the flowers, put 'em into a warm glass, they are highly emetic; the fœces at bottom may be mix'd with fresh salt armoniac, and proceed as before. 2^{dly}, Put these flowers in water, the water grows milky, and when it subsides, the water tastes salt and armoniacal; wash these flowers and dry 'em by the fire, they are a red emetic powder, you may regain the salt armoniac, by evaporating the water.

Its Uses.

Thus we see the death and revival of antimony, thus all pigments are made, but be of what colour they will, they are all emetic.

P R O C E S S CCXXVI.

Helmont's *fixt and diaphoretic flowers of anti-*
mony.

P R E P A R A T I O N.

Take the flowers of the former Process one pound, nitre three pound, powder 'em in a glass mortar, throw this gradually into a red-hot crucible, when the detonation is over, throw in more till the whole quantity is thrown in, let 'em cool, take out this palish yellow matter, powder it, wash it with water, 'tis a white powder; fire alcohol upon it, 36 grains of it raises sweats in fevers.

Its Uses.

Thus have we a method of fixing a volatile substance; but I have not found the effects *Helmont* boasts off.

P R O C E S S CCXXVII.

A purgative Diaceltateffon of Helmont from the fine flowers of antimony.

P R E P A R A T I O N.

Take 18 grains of the powder in the former Process, 16 grains of resin of scammony, seven grains of cream of tartar; make a powder, or take nine grains of the former powder, nine grains of resin of scammony, three grains of cream of tartar, this is *Helmont's* diaceltateffon; the first is the greatest, the last the least dose; an acid stops its operation, therefore give it with no acid, give it before the fit of an ague, it cures quartans

got the water pure ; then mounted somewhat sub-acid ; and, lastly, the true spirit of salt.

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tans

tans before the fourth dose as well as continual and intermitten fevers. See *Helmont*.

Its Uses.

Helmont says, it cures the gout and fevers radically, as also ulcers of the larynx, bladder and œsophagus, that it purges the body no longer than 'tis not sound, the *Latin* edition says, that eight grains are sufficient; I have given it my self, and observ'd that it works well, but have always suspected *Helmont's* sincerity.

Thus have I finish'd my Processes and have discharg'd my duty, I will only recapitulate some things observable, and of use to physick and natural philosophy, drawn from the aforesaid operations.

The End of the P R O C E S S E S.



Chymical Solution.

1st, **I**T is done by water, dilution, infusion, decoction, distillation, mixtion, fermenting, putrefaction, and by separating.

2^{dly}, With the help of oil, by dilution, infusion, decoction, distillation, mixing, separation; but not by fermentation, nor putrefaction.

3^{dly}, With the fire, by calcining, burning, fusion, sublimation, mixing, separation, and helping the actions of other bodies.

4^{thly}, With air, by fermenting, putrefying, agitation, adding other parts able to dissolve.

5^{thly}, By means of fermented spirits, by dilution, infusion, decoction, distillation, mixing, making the oils thinner and more liquid.

6^{thly}, With alcalious salts, by calcining, burning, fusion, mixing, separating, according to the various strength of the fire.

7^{thly}, With volatile alcali's, subliming 'em together the dry way, by diluting, digesting, and distilling the moist way.

8^{thly}, With fixt alcali's, by the means of fire and water, mov'd by digestion, decoction, dilution, separation, and mixing.

9^{thly}, With acid fixt salts, of alum, sulphur, nitriol, by decoction, distilling, digesting; or the dry way, by calcining, burning, and distilling.

10^{thly}, With volatile acid salts, by dilution, digestion, distilling, and insinuation.

11^{thly}, With compound salts and soaps, by calcination, subliming, distilling, digestion, the dry or liquid way.

12^{thly}, With metals, by fusion or amalgamation.

Chymical Coagulation.

1st, With water, by congeling, crySTALLISING, precipitation, as in *Mercurius vitæ*.

2^{dly}, With oil, uniting sulphurs, salts, and metals.

3^{dly}, With alcohol in volatile alkaline spirit of salt, in the white of an egg, the serum of the blood, and oil of vitriol.

4^{thly}, With alkaline and acid salts growing solid, as in *Tartarus vitriolatus*.

5^{thly}, With fixt alcali's, as in milk.

6^{thly}, Acid salts, as in milk, serum, and the white of an egg.

Chymical Precipitation.

This action is a manifest separation of the body dissolv'd and disappearing, from the dissolvent, by the mixture of something new. This is of great use, deserves to be accurately consider'd, and has been every where observ'd in the Processes.

1st, 'Tis perform'd by water pour'd on oils dissolved in alcohol, with the appearance of milk.

2^{dly}, By water pour'd on resinous bodies in alcohol, with the appearance of milk.

3^{dly}, By water in the distillation of oleous spirits, if in the end the water comes off.

4^{thly}, Of acids by acids. Silver dissolv'd in spirit of nitre is precipitated by spirit of salt, and mercury after the same manner.

5^{thly}, Of metals by metals, &c. Behold here a glass, in which there's an ounce of silver dissolved in spirit of nitre, diluted with 12 times the quantity of rain water, I put thin plates of copper, presently the silver is precipitated, and copper

copper dissolv'd. I hold in this glass the copper dissolv'd in spirit of nitre, from whence the silver was precipitated, and I throw little laminæ of this glassy copper, the copper immediately is precipitated, the iron is of a brassy colour, the brass falls to the bottom, and the iron is dissolv'd. Now in this glass I have the iron dissolv'd in spirit of nitre, whence the brass was precipitated, to this I pour in oil of tartar *per deliquium*, the iron falls, the alcali unites itself to the acid, and after all these changes the true nitre appears: Upon these rely precipitation, the true cause of a great many operations both in art and nature. I take a grain of white or red precipitate mercury, this I rub upon a piece of copper finely polish'd and hot; it shines like silver; for the copper by attracting the nitrous acid from the calx of the mercury, makes an amalgam, hence the silver colour.

6thly, Alcali's very often precipitate those things that are dissolv'd by acids, but not always. An alcali precipitates copper dissolv'd by an acid.

7thly, Acids for the most part precipitate bodies dissolv'd in alcali's; but here also is an exception.

8thly, The most acid and hidden salts, by precipitation produce wonderful effects: An ounce of *Luna Cornea*, in which there is no sign of an armony, being powder'd and mix'd with half an ounce of regulus of antimony, makes a most violent butter of antimony: How dangerous therefore is the art of mixing bodies; and what caution is requir'd in their composition?

Chymical Effervescence.

'Tis said to be the sudden commotion arising upon mixing two bodies: This happens various ways;

ways; 1st, Acids, vegetable and native, most juices of plants, trees, unripe fruits, &c. fermented vegetables, *Moselle* and *Rhenish* wines, tartar, vegetables twice fermented, native vinegars and distill'd; (k) acids of animals, in the aliments, chyle, milk, &c. growing sour; of fossils, as that of sulphur, alum, and calcanthum, whether native, or drawn out by a strong fire, or acid, as of nitre, salt, &c. 2^{dly}, True fixt alcali's, made out of vegetables by burning; volatile alcali's, either spontaneous, as in garlick, onions, mustard, &c. or made by putrefaction out of animals or vegetables, or produc'd by distillation and burning. 3^{dly}, Some bodies improperly call'd alcali's, because they effervesce with acids; all boles, shells, corals, horns, chalk, bones, stones, &c. 4^{thly}, The seven metals. 5^{thly}, The semimetals, as bismuth, lapis calaminaris, zinc, &c. Hence, *Canon 1.* Bodies of the first class effervesce with those of the second and third; the effervescence lasts till the saturation, then leaves off; the acrimony after an accurate saturation is mitigated. *Canon 2.* Bodies of the first class effervesce with those of the fourth, but not always alike, and after the saturation they generally become vitriols. *Canon 3.* Bodies of the first class effervesce with those of the fifth, according to the same law. *Canon 4.* Bodies of the 2^d, 3^d, 4th and 5th Class are scarce observ'd to effervesce at all. Hence the strength in acids is to be limited. Spirit of vinegar pour'd on oil of tartar, at first does not grow hot, but when the alcali is made weaker, it heats.

2^{dly}, Pure volatile alcali free from all oil, mix'd with the sincere acid of vinegar, effervesces, but grows cold, when other bodies are hot, and some

(k) N.B. He owns Acids in Animals, which he had deny'd strenuously in this whole Treatise.

times

times to so high a degree as to flame; hence motion can be augmented with cold: See Part I. p. 376, &c. *Comp. Act. Ph.* Tom. III. 354, 356.

3dly, In most other effervescences heat ensues: See Part I. from page 365 to 379.

4thly, Some bodies raise a flame in a moment. I place in a dry urinal, which is hot, a dram of oil of cloves, to this I pour two drams of *Glauber's* spirit of nitre; immediately there arises a terrible effervescence with smoke and flame; this being done, the matter is brown and spongy: See *Stare's Comp. Act. Ph.* Tom. III. 353 — 365. *Hoffman's Differ. Chem.* 38, 45, and 126. Here the acid and oil meet together, not the alkali and acid; the other effervescences are to be found in *Homburg Ac. R. Sc.* 1701. p. 84, 95. 1708. p. 2.

5thly, Hard bodies also produce an effervescence; as out of iron and sulphur powder'd and made into a paste there arises a flame.

A short recapitulation of Alkali and Acid.

Alkali is either a fixt or volatile salt; 'tis known, 1. From its being produc'd by the help of the fire, putrefaction or nature. 2. From its matter, vegetable, animal, or fossil. 3. From its effervescence with acids; its precipitation; mixing with oils; dissolving sulphur; changing the colours of the sun-flower, roses, violets, into a green, which by acids is turn'd into a red; it may be known by its taste, raising a burning pain. An acid is a fixt or volatile salt: 1. 'Tis native, fermented or produc'd by the fire. 2. Its matter is vegetable or fossil. 3. It effervesces with alkali's, earths, corals, &c. it precipitates bodies; it turns neutral with alkali's or earth; it dissolves the metallic part of mercury; it changes the colour of the sun-flower, roses, and violets, into a red: In fine, 'tis known by its taste, smell, and raising

raising pain upon the skin. This doctrine is pretty sure, but not to be carried too far; we must not be content with one physical mark to shew us the presence of an alcali or acid, which is common with others; v.g. an alcali effervesces with spirit of nitre, silver does the same; therefore silver and alcali are the same thing; (1) this does not follow; yet we have seen very ingenious gentlemen draw these consequences, which is certainly a vile error. Gold effervesces with the acid spirit of *aqua regia*, therefore, say they, 'tis an alcali; but it does not effervesce with spirit of nitre, therefore this is no alcali. How vain is it to account for all effects in nature, from an alcali and acid! See *Boyle* and *Bohnius* upon this subject.

The production, destruction, and change of Smells and Tastes.

We have seen these changes from the first to the last Processes: See *Boyle's* treatise of the production of sensible qualities.

The production, destruction, and change of Colours.

1st, Antimony when powder'd is black; after 'tis calcin'd with *aqua regia* 'tis a greenish yellow; when sublim'd with salt armoniac it is white, red yellow, greenish, and black; 'tis a red, when the water is free from the salt; but is white, when fix'd with a triple quantity of nitre: See here almost all colours from one solid mass. Quick silver corroded with *aqua fortis*, by distilling gives all colours in various places of the retort, as you have already seen.

2^{dly}, Pouring a very pellucid liquor into a clear vessel we have a most black colour; this is done

(1) N. B. Silver with respect to those Acids which can dissolve it, is an alcalious Metal.

if we wash any glass vessel with the solution of *vitriolum martis*, and heat it, then pour into it rain water in which galls have been infus'd; in lieu of galls; red roses, tea, sage, or oak leaves, will do the feat.

3^{dly}, By throwing a little white powder into a pellucid liquor I make a black colour: Here is a clear infusion of galls, in this glass, heated; to this I add one grain of vitriol of steel calcin'd white; how pleasant is it to see the pellucid liquor turn black!

4^{thly}, The same is done with a yellow powder; if in place of the white vitriol you take as much of it calcin'd yellow.

5^{thly}, The same may be done with a red powder; if you put in a little colcothar of vitriol of iron calcin'd red, or a little *Ens veneris*.

6^{thly}, We do the same with a pellucid drop, if we drop into the infusion of galls one drop of vitriol of steel dissolv'd in water.

7^{thly}, To do the same with a golden drop, we must pour in a drop of the golden tincture of the red calx of vitriol of steel with mild spirit of salt. In all these experiments, whilst the colour changes into a black, there arises an innumerable sight of colours, which at last terminate into black.

8^{thly}, The black colour made N^o. 2, 3, 4, 5, 6, 7, is chang'd into a pellucid only by transfusing into a clean vessel; 'tis done if you transfuse those black warm liquors into a glass, wash'd with oil of vitriol on the inside, the acid absorbs the metallic part of the iron; mean while those that are made black with *Ens veneris* or colcothar of steel, become somewhat reddish whilst they are becoming pellucid.

9^{thly}, To make this pellucid recover its blackness, pour on so much oil of tartar, and when the effervescence is over the feat is done.

10^{thly}, Pour on to this black, spirit of nitre, and the transparency returns.

11^{thly}, To make a colour by the transfusion of a pellucid liquor into a clean glass; wash the glass with spirit of salt, pour in to this the solution of silver in spirit of nitre; oil of antimony does the same thing.

12^{thly}, To make an orange colour from a pellucid, wash a clean glass with any acid, pour into this water in which *crocus metallorum* was pour'd into hot.

13^{thly}, To make a colour by the affusion of a pellucid to a golden colour'd powder, pour alcohol to *hepar sulphuris* warm.

14^{thly}, To change a golden colour into a milky one, take the tincture N^o. 13, pour it into a glass moisten'd with oil of vitriol.

15^{thly}, To turn a pellucid liquor into a blue, to verdigrease, diluted with vinegar and water pour'd on to it, pour on spirit of salt armoniac.

16^{thly}, To return a blue into a pellucid liquor, put in any acid to N^o. 15.

17^{thly}, To turn a green into a violet colour, to vinegar, which has dissolv'd copper, put in spirit of salt armoniac.

18^{thly}, To turn a blue into a green, to spirit of *sal armoniac* in which copper has been dissolv'd, pour in vinegar.

19^{thly}, To make various greens and blues, to *aqua sapphirina*, made with spirit of salt armoniac, pour in spirit of nitre gradually, and you will see the different changes.

For the rest see Mr. Boyle on colours; I shew'd you some of his experiments. I finish my course, and return you thanks for your patient attendance: I wish these lectures may be for the service of mankind.

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CXCIV. —dissolv'd in <i>Aqua</i>	<i>ibid</i>	CCXXVI. Flowers fix'd	199
<i>fortis</i>		CCXXVII. Purgative of it	199
CXCV. Vitriol	176		
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CXCVII. Red Precipitate	<i>ibid</i>		
CXCVIII. Sublimate	178		
CXCIX. Turbith	179		
CC. Its Caustic Oil	180		
CCI. <i>Æthiops</i>	181		
CCII. Cinnabar	<i>ibid</i>		
CCIII. Amalgam	182		
CCIV. Washing of Metals			
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CCV. Gold dissolv'd	184		
IV. On Saline Semimetals			
	185		
CCVI. Vitriol dissolv'd into			
Spirit, Oil and Colcothar			
	185		
CCVII. — <i>Ens Veneris</i>	186		
On Sulphureous Semimetals			
	187		
CCVIII. Antimony dissolv'd			
in <i>Aqua Regia</i>	187		
CCIX. Its Sulphur	<i>ibid</i>		
Tom. II.			

APPENDIX.

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Precipitation	<i>ibid</i>
Effervescence	203
Acid and Alkali	205
Tastes and Smells made and	
destroy'd	206
Colours produc'd, destroy'd,	
chang'd	<i>ibid</i>

*An Index of the Virtues of the
Chymical Medicines, accord-
ing to the Processes.*

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Alcalies on Oils	73, 74
Apoplexies	23

B

Balsamicks	35
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P

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I N D E X.

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Cautic	221, 182, 13.	Lithonriptick	12, 101, 135
Cordial	1	Lues Venerea	2
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Carminative	16, 23, 135	Melancholy	16
Colick	23	P	
Cosmetick	59	Palsy	33
D		Piles to move	16
Diaphoretick	16	—— painful to relieve	36
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Jaundice	12	Wormwood Water	30
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Lethargy	30	Whites	50
<i>Leucophlegmatia</i>	12		

6
5
2
6
3
6
6
6
35
107
48
12
16
133
51
53
190
121
30
-16
30
166
50

A N

Fig. I.

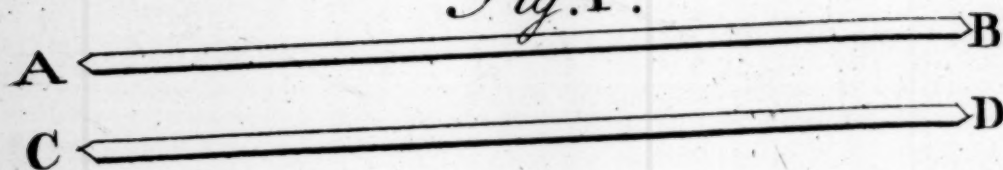
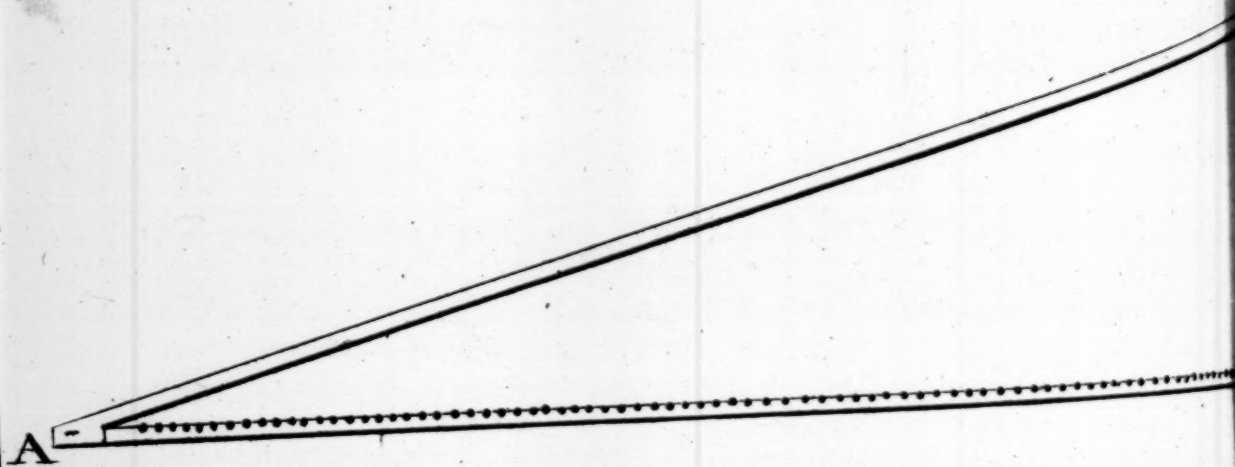
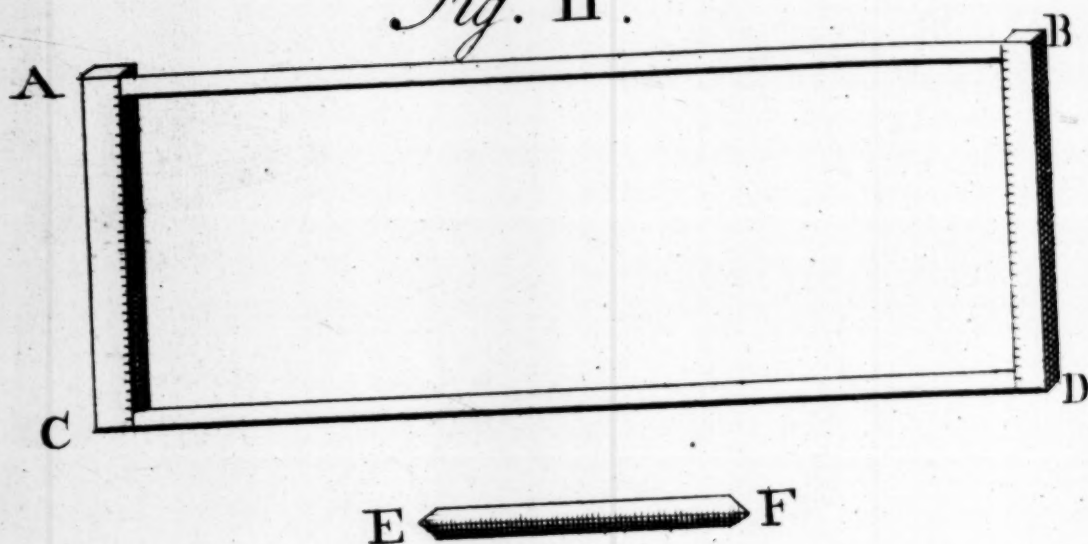


Fig. II.





A N

Explanation of the PLATES.

PLATE I.

FIG. 1.

- AB. CD. *Two cylindrical Rods, three Feet long, of Iron.*
EF. E. *A Ring with a Handle F. to measure with.*

FIG. 2.

- AC. BD. *Two parallel Plates, equally divided.*
AB. CD. *Two parallel Plates to move up and down.*
EF. *An Iron Rod to be measur'd hot and cold.*

FIG. 3.

- AB. *A Brass Plate divided into parts.*
BC. *Another divided, and perpendicular from B.*
AC. *Another fixt in A. moveable on BC. to number the Degrees.*

P L A T E II.

F I G. I.

ABCD. Drebbel's Thermometer.

A. Its Globe.

BD. Its Neck full of Air to D from A.

DC. Its Neck full of ting'd Liquor.

E. The Vessel containing the ting'd Liquor.

F I G. 2.

AB. DC. EF. Another more sensible.

ABCD. Its fore Prospect.

F I G. 3.

ABCDEF. The same in Profil.

Fig. I.



Fig. II.
A D

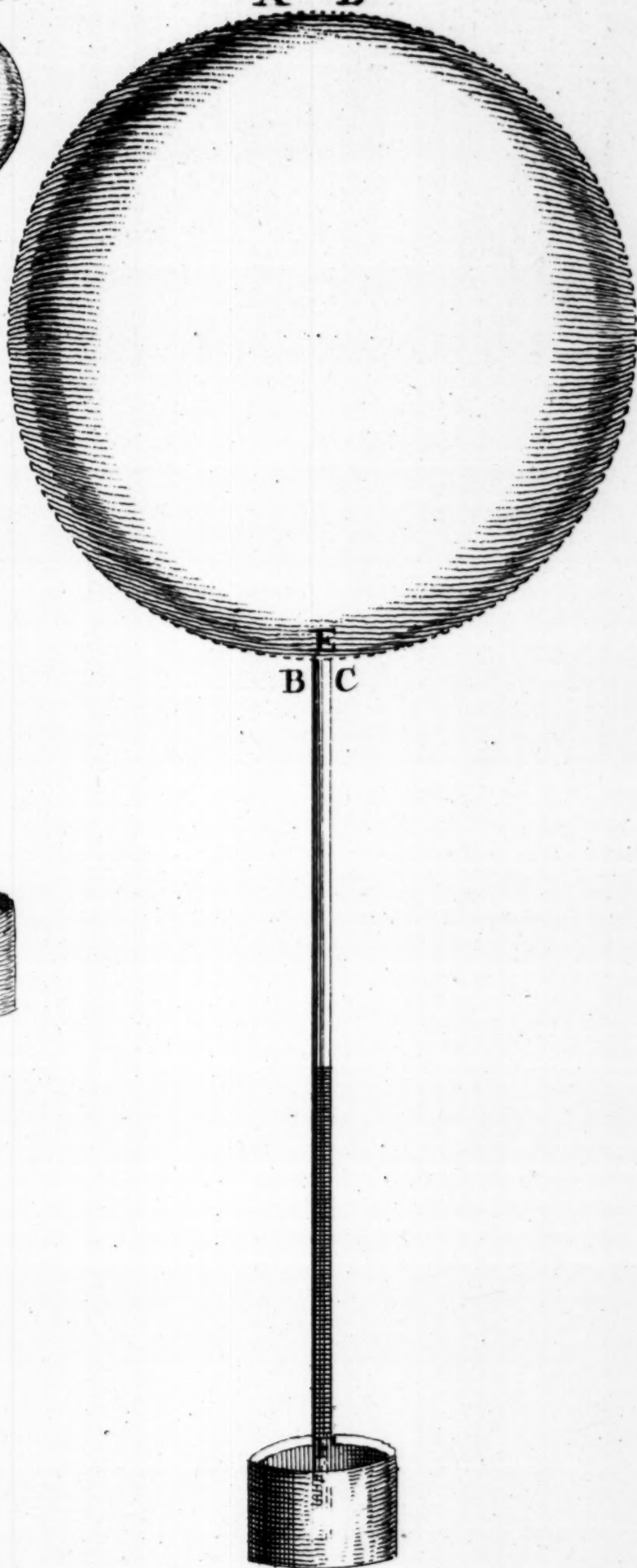


Fig. III.
A D

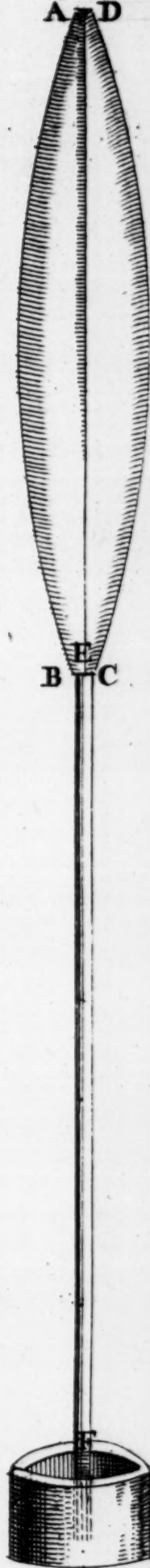


Fig I.

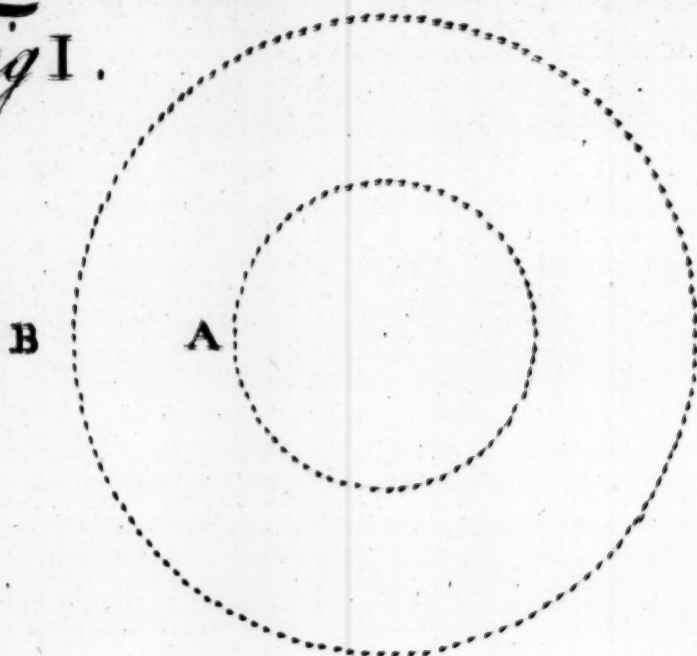


Fig II

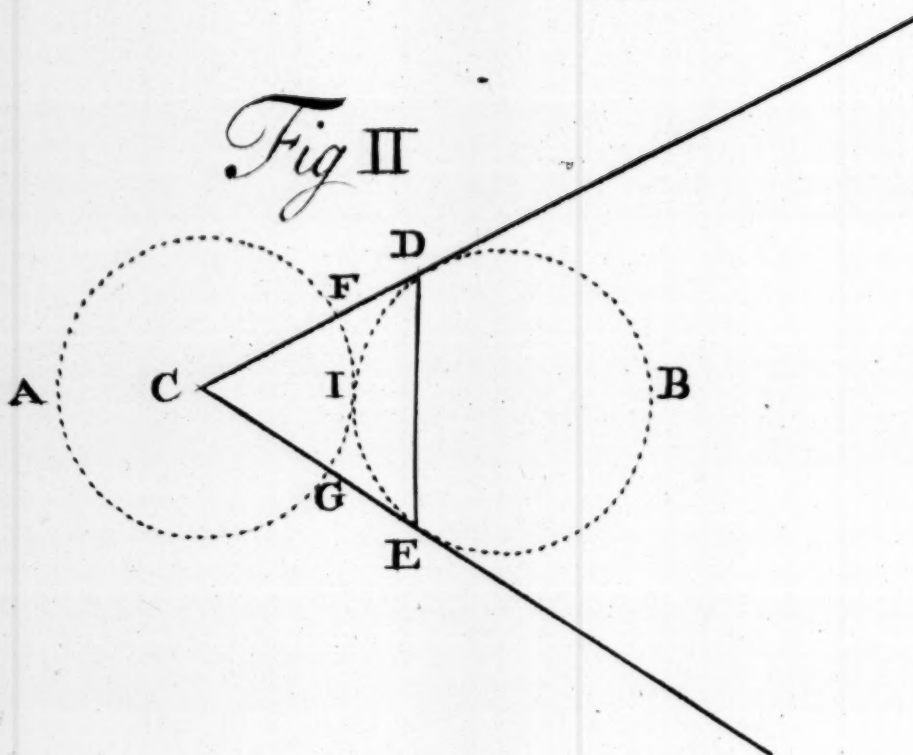


Fig III.

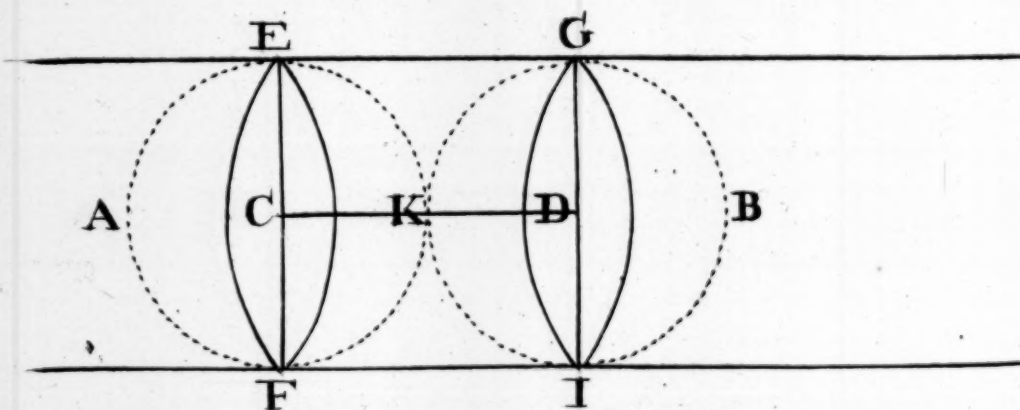


PLATE III.

FIG. 1.

- A. *A small Globe of Fire.*
- B. *A larger.*

FIG. 2.

- AFIG. BDIE. *Two equal Globes touching in I.*
- CD. *A right Line from C touching in D.*
- EE. *Another touching in E.*
- CFG. *A Sector.*

FIG. 3.

- A. *A Globe equal to and touching B.*
- C. *The Centre of A.*
- D. *The same of B.*
- K. *Points of Contact.*
- CKD. *A right Line joining their Centres.*
- EG. *A Parallel to CKD.*
- FI. *A Parallel to EG.*
- EFGI. *A Cylinder to measure the Ratio.*

P L A T E IV.

FIG. 1.

ABCD. *A hollow Cylinder.*

BD. *Its opening.*

EFG. *A hollow Cylinder, close at E, open at BD the Grate, and at G.*

FIG. 2.

ABCDEF. *A hollow Parallelopiped, open at ABCD, the Fire in ILKM.*

ILKM. *The Grate.*

EM. *The place for the Smoak, when OGH is hot.*

NO. *The opening, its Length KM.*

NOGH. *The hollow Tube open at NO and H.*

FIG. 3.

ABC. *A Glass open at C.*

AB. *Its Bottom cut open.*

D. *A Brass Cylinder for Liquor.*

EFG. *Tiles to place the Cylinder on.*

FIG. 4.

ABC. *Another Glass Vessel.*

E. *A Pan for Coals.*

D. *A Brass Pan for Spirits.*

FGL. *Files.*

H. *The Flame.*

Fig. I.

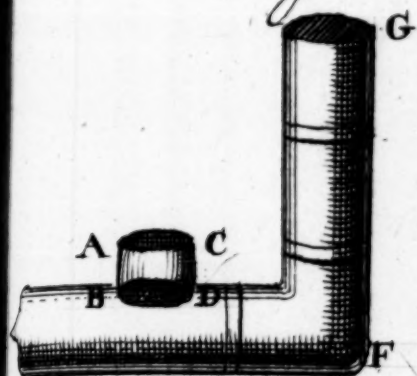


Fig. II.

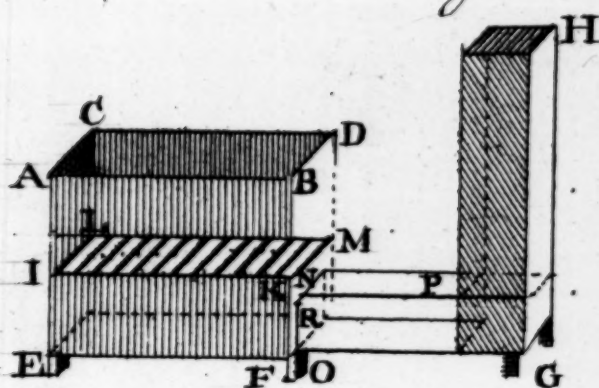


Fig. III.



Fig. IIII.



Fig. I.

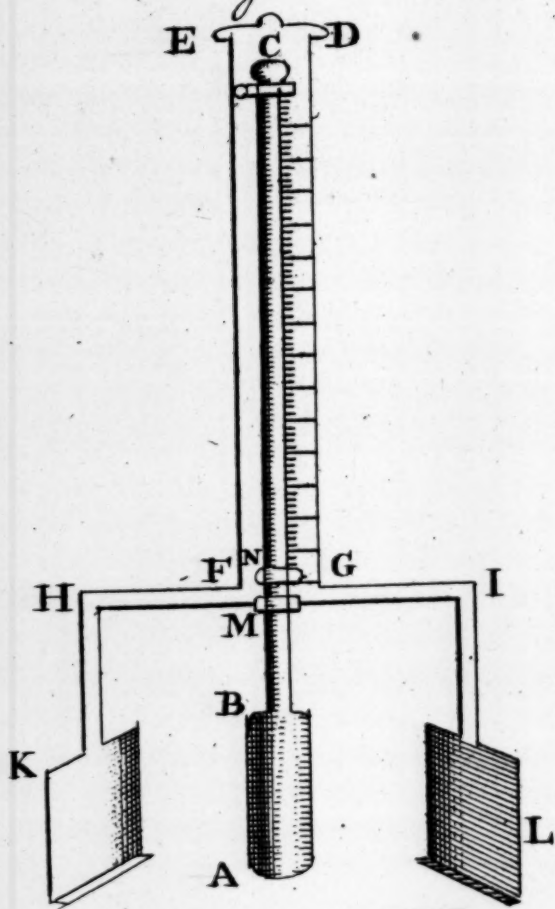


Fig. III.

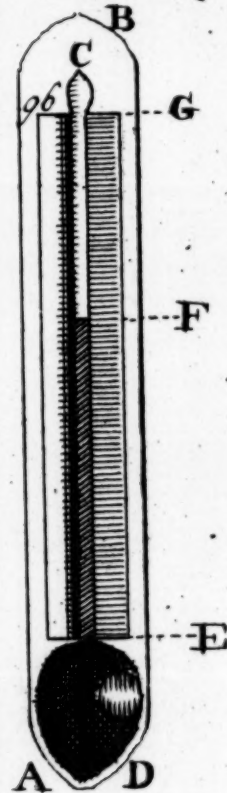


Fig. II.



Fig.



PLATE V.

FIG. 1.

ABC. *A Thermometer fasten'd to DEFG by MNO.*

DEFGHIKL. *A wooden Machine to sustain, and to move it.*

PQ. *A Vessel to dip it into.*

FIG. 2.

ABC. *Fahrenheit's Thermometer, with ting'd Spirits and Degrees.*

AB. *The Bulb of it.*

BC. *The Pipe for the motion of the Spirit, &c.*

FIG. 3.

ABC. *Another of Fahrenheit's for Quicksilver.*

AB. *The Bulb, from A to B, of 11520 parts.*

BC. 96.

BC. *The Pipe.*

FIG. 4.

AB. *Another of Fahrenheit's, for human heat.*

AB. *The Tube transparent, seal'd hermetically.*

DC. *Ting'd with Liquor, or fill'd with Quicksilver.*

DE. *The Bulb.* EG. *The Neck.* EF. *The Liquor.* EFG. *A Paper divided into parts.*

P L A T E VI.

FIG. 1.

ABCD. *The Brass Plate to fasten it to.*
EF. *The Glass with Quicksilver.*
GE. *Its Bulb.*
GF. *Its Neck mark'd into 600 parts.*
GH. *Brass Semicircles to fasten it.*
abcd. *A Vessel to dip it into.*

FIG. 2.

A. *A Cylindrical Vessel full open at a.*
D. *A Paper to cover a.*
BB. *A Conical Vessel for the same use.*
C. *A Jug for the same.*

Fig. I.

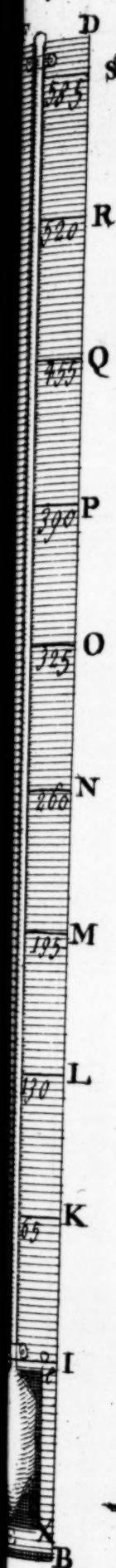


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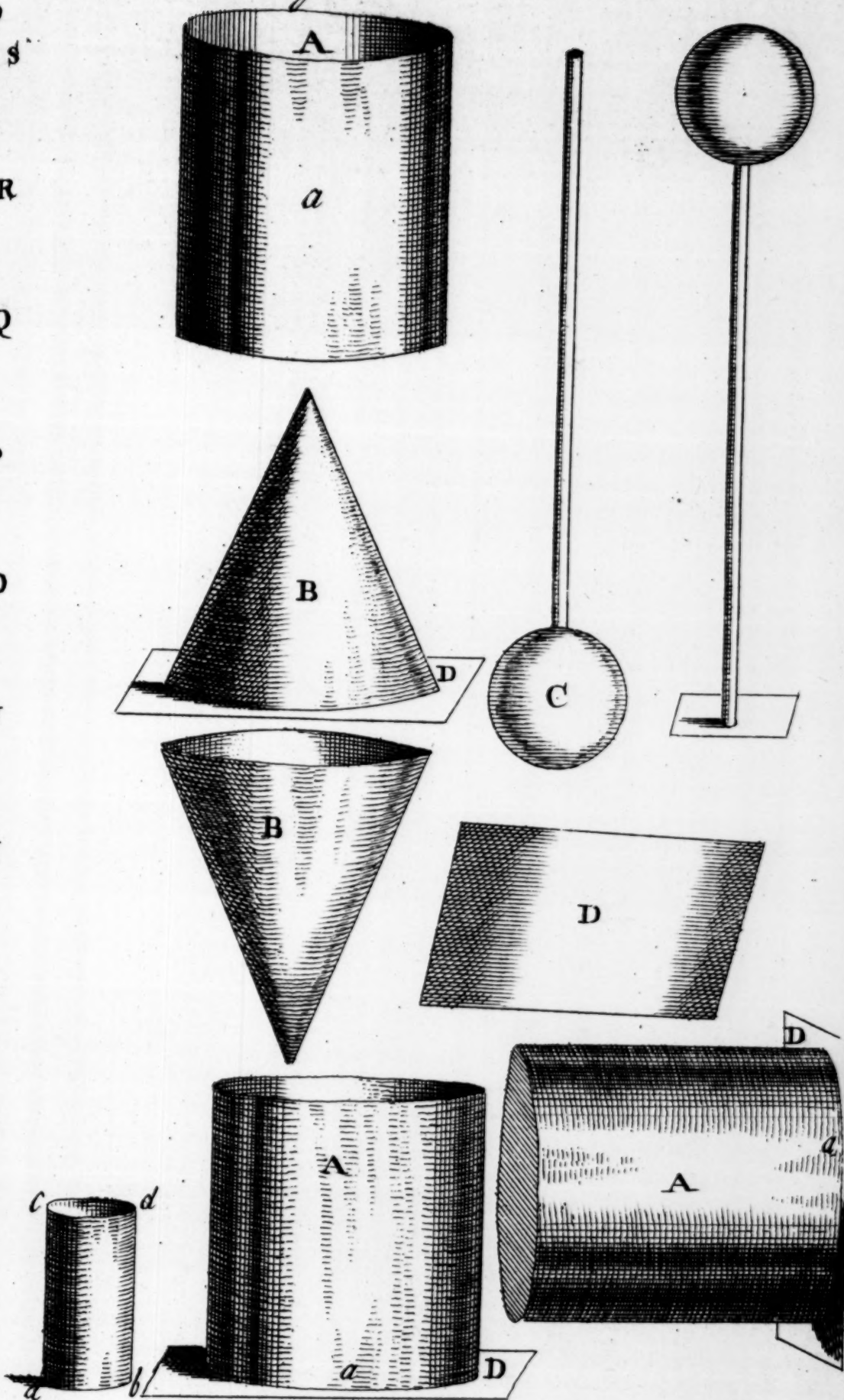


Fig. I. Fig. II.

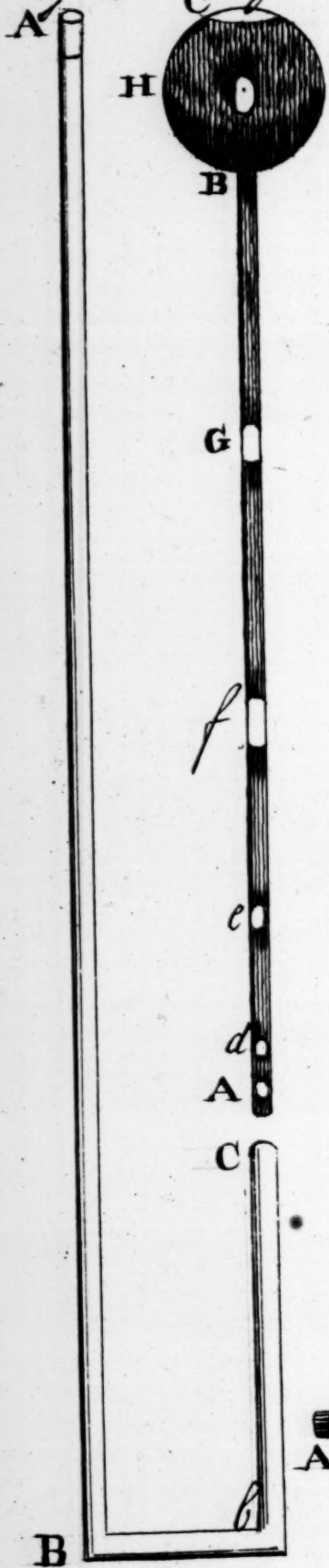


Fig. III.



Fig. III.



PLATE VII.

FIG. 1.

AB. bc. *A Glass Tube.*
 AB. *The longer Leg.*
 bc. *The lesser Leg.*
 A. *The opening to put in the Quicksilver.*
 C. *The close End.*

FIG. 2.

ABC. *A Vessel inverted full of Water.*
 BC. *Its Bulb.*
 AB. *Its Neck.*
 A, d, e, f, g. *Bubbles.*

FIG. 3.

ABC. *Another full of Water inverted.*
 B.C. *Its Bulb.*
 AB. *Its Neck.*
 d, e. *Airy Bubbles.*

FIG. 4.

ABC. *Another full of Water horizontally plac'd.*
 d, e. *Bubbles.*

FIG. 5.

ABC. *A strait Glass Tube.*
 AC. *Water to put it into.*
 CD. *The Water ascending.*

P L A T E VIII.

FIG. 1.

ABC. *Three Glafs Veffels with Water heated.*
 DEHI. *A Brafs Platter fix'd on KL, a Sucker.*
 FGMN. *A Bell on DEHI.*

FIG. 2.

AB. *A Glafs Cylinder.*
 CD. *A Glafs Veffel.*

FIG. 3.

AB. *A Brafs Cylinder.*
 ACD. *A Funnel.*
 EFG. *The Veffel full of Water.*

FIG. 4.

AB. *A Copper Veffel, B. Bottom, D. A Cone,*
 E. *A Conoid, F. Lying down, G. A Candle.*

Fig. II.



Fig. I.

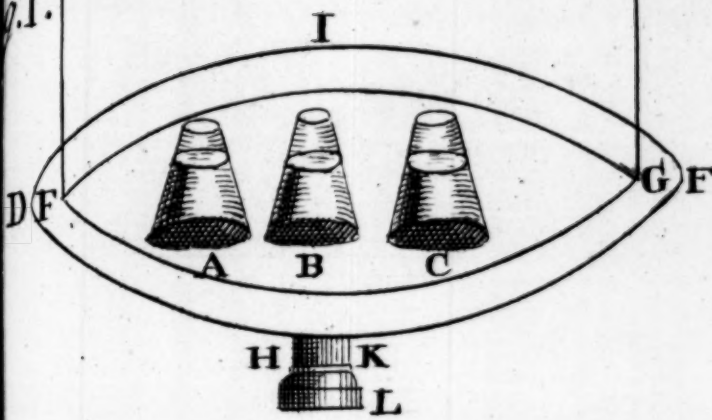


Fig. III.

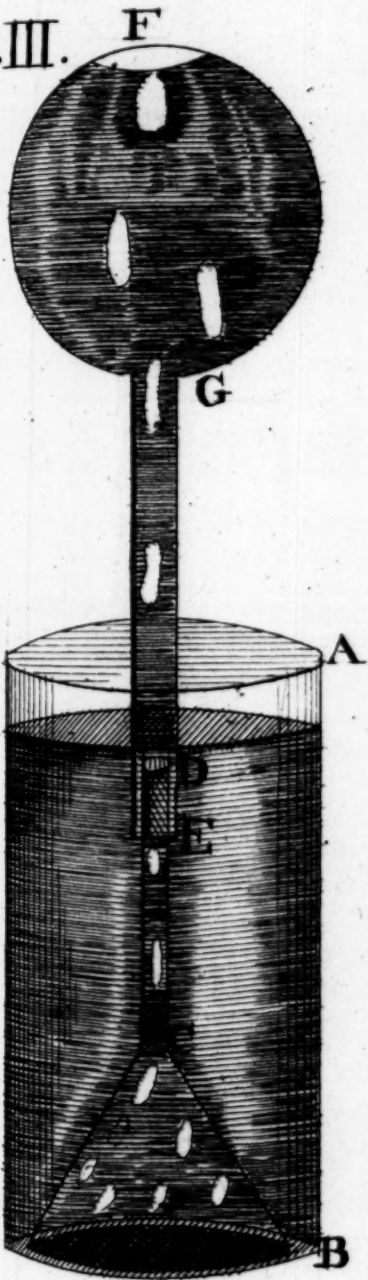


Fig. III.

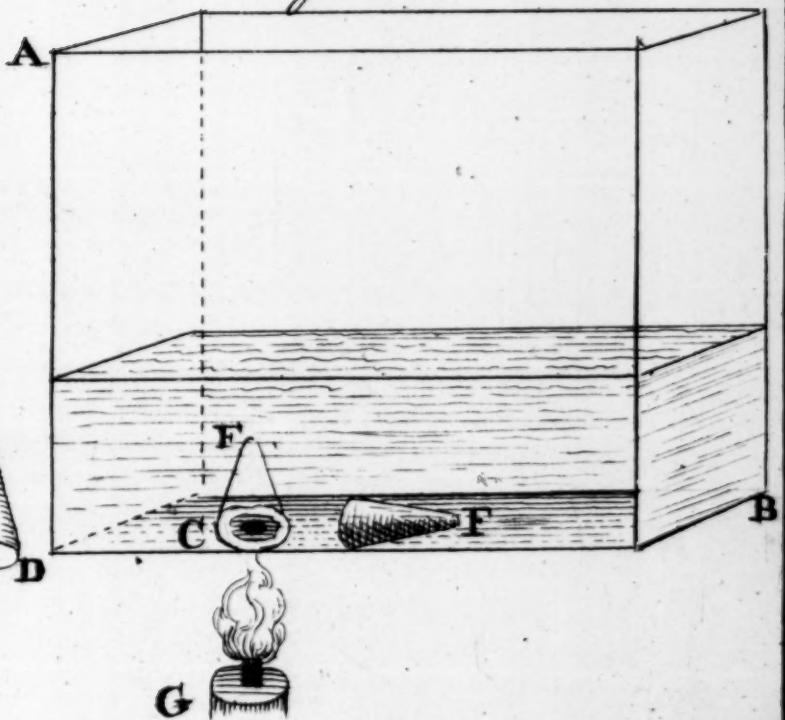


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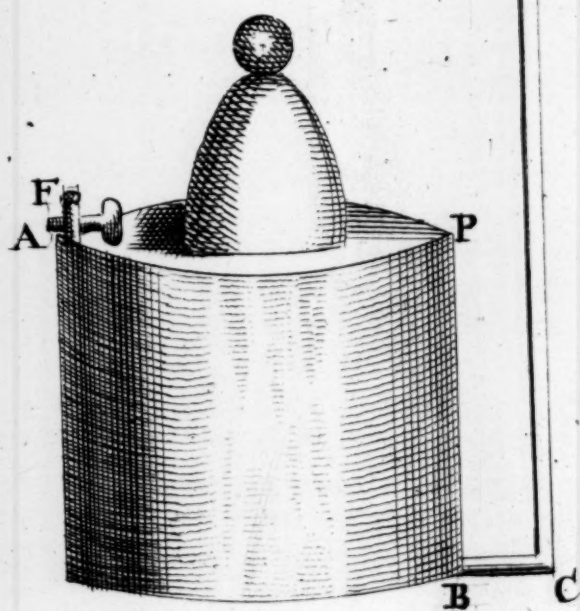


Fig. II.



Fig. III.

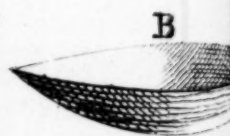
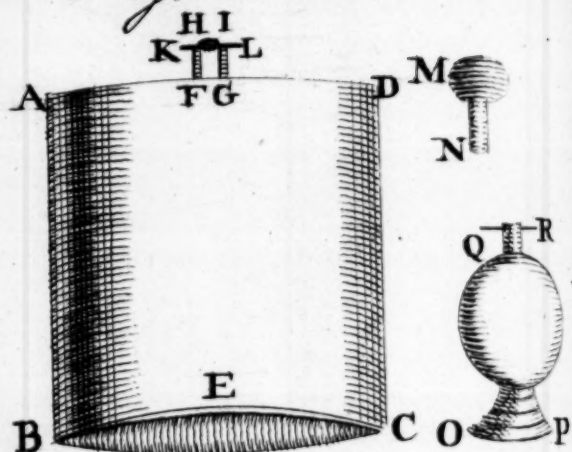


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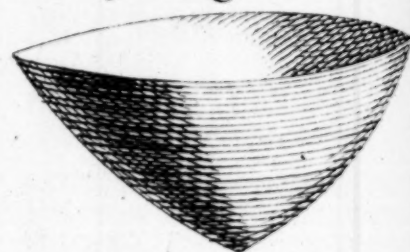


PLATE IX.

FIG. 1.

AB. *A Brass Cylinder.*

B. *A Tube solder'd.*

AE. *A Cock to turn.*

BCD. *A Brass Tube, open at B, and D, to pour in any thing by D.*

FIG. 2.

AB. *An Iron Cone, divided.*

CD. *A wooden Cone to fit AB in a certain degree of Heat.*

FIG. 3.

ABCD. *A Cylindrical Glass.*

BCD. *Its Bottom.*

FGHI. *Its Neck, open at HI.*

KL. *A Glass round Margin.*

MN. *A Glass Stopper.*

OPQR. *A Glass Jug for Oils.*

FIG. 4.

ABC. *Crucibles for bearing Fire.*

PLATE X.

FIG. 1.

ABCDEF. *A Retort.*

ABCD. *Its Belly.*

AF. *Its Back.*

DE. *Its low part.*

The last of these three is the best.

FIG. 2.

ABCDE. *A Vessel to distill Phosphorus.*

FIG. 3.

ABCDEFGH. *A Vessel to bear the heat of a
Furnace.*

IKLM. *A Cylinder to put on to HG.*

ONPQ. *A larger.*

Fig. I.

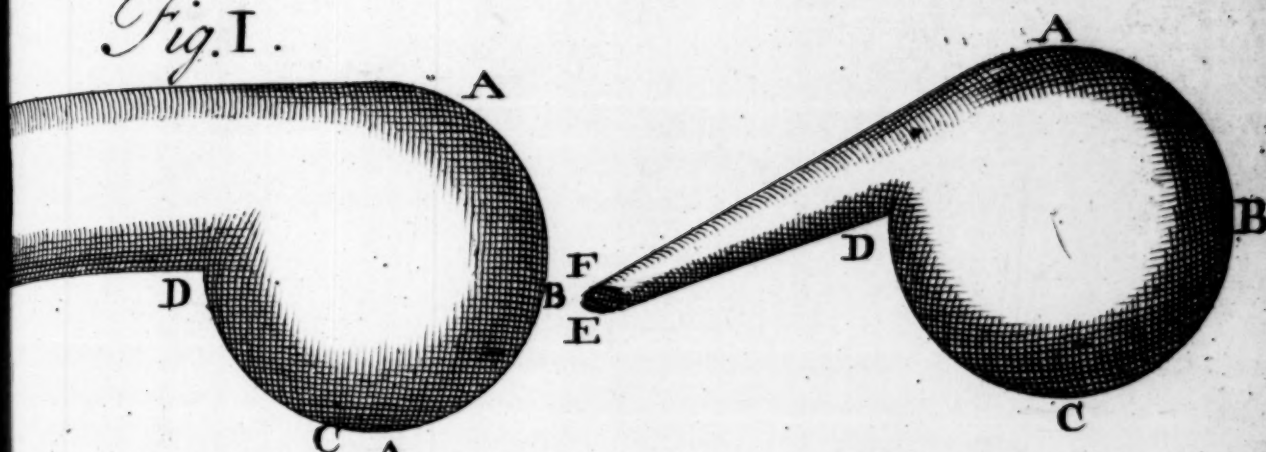


Fig. II.

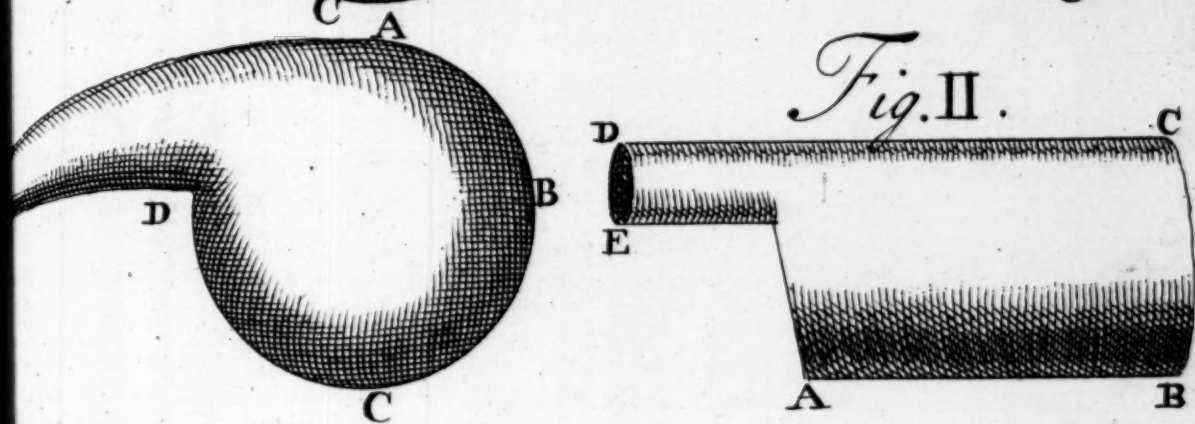


Fig. III.

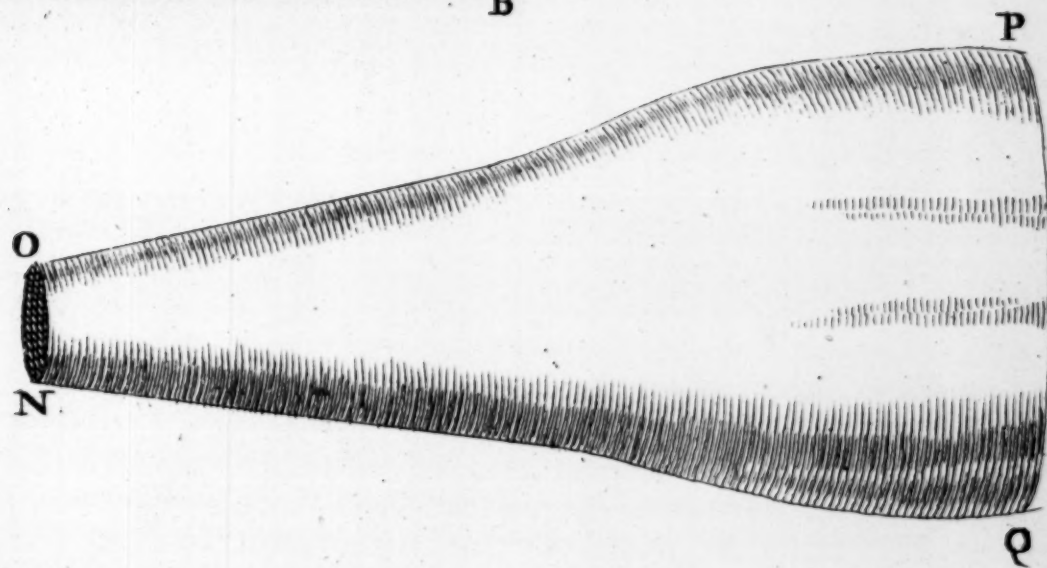
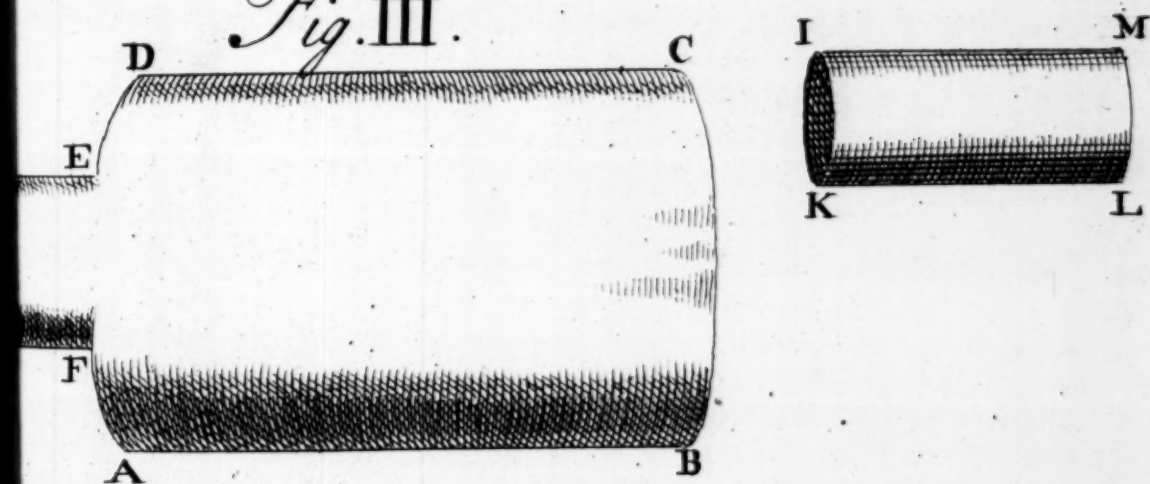


Fig. II.



Fig. I.
E

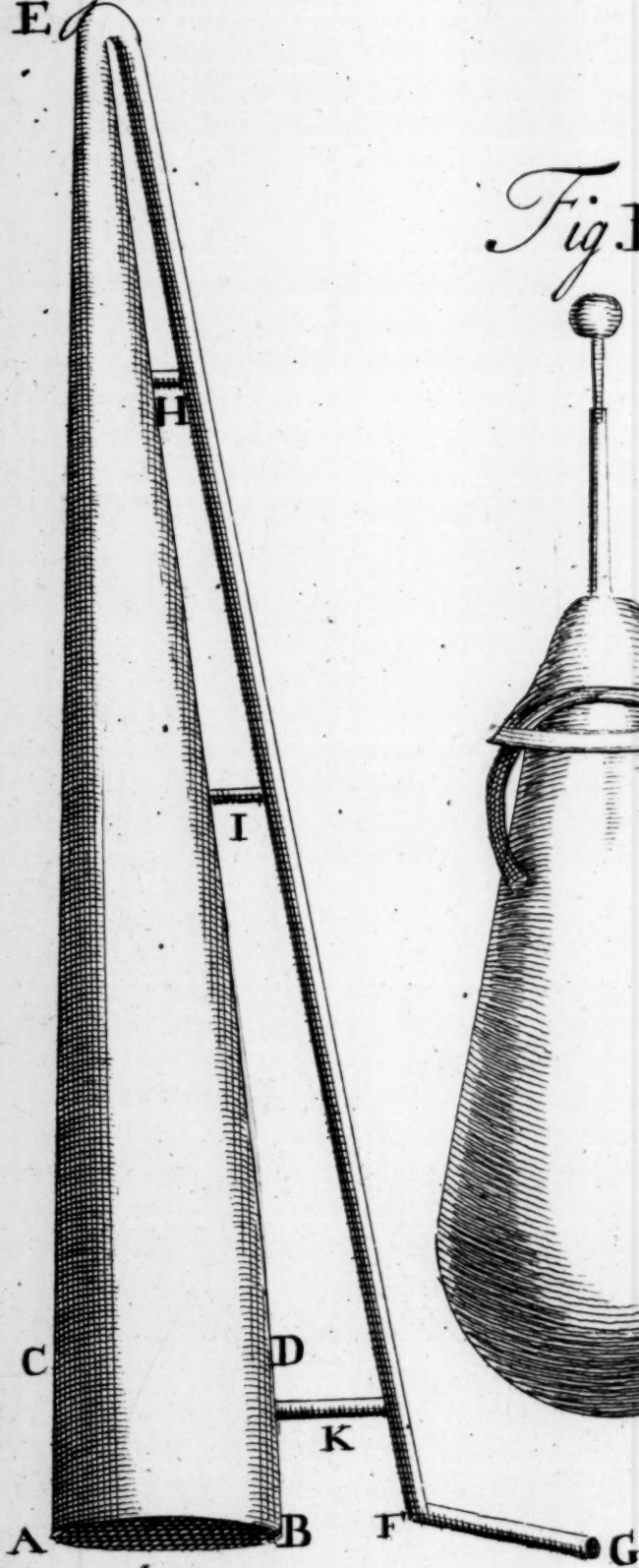


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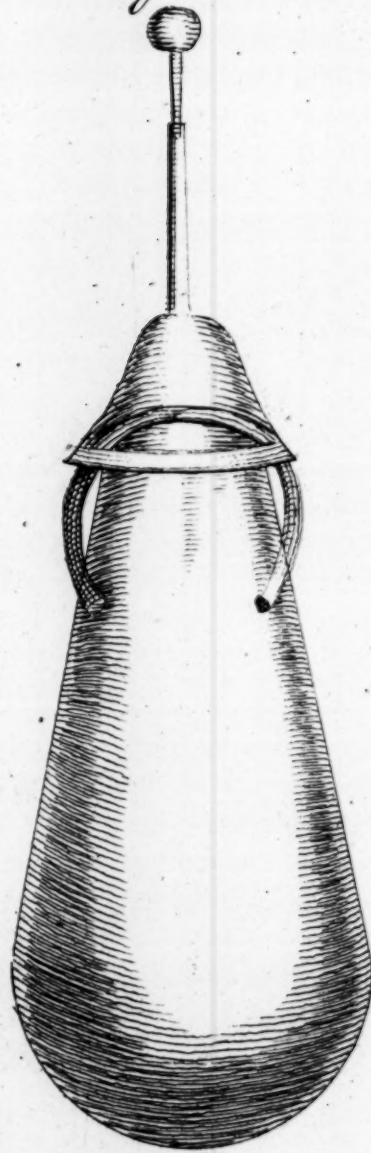


Fig. III.

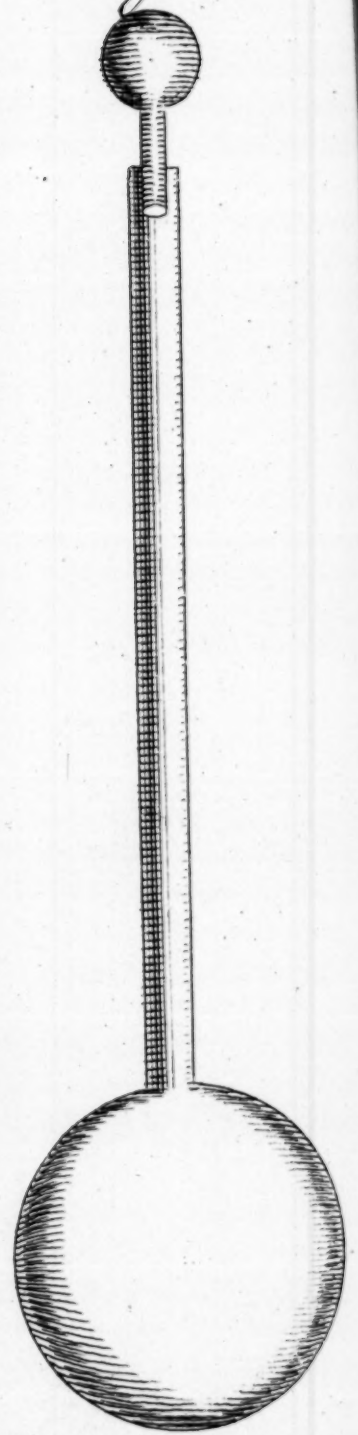


PLATE XL

FIG. 1.

ABCD. *A Tin Cylinder.*

CDE. *Its Height.*

EF. *Its descending Tube.*

FG. *Its Rostrum.*

HIK. *Props.*

This is for making Alcohol.

FIG. 2.

Glass Jugs.

FIG. 3.

Pelican.

FIG. 4.

Another Pelican.

PLATE

PLATE XII.

FIG. 1.

ABCDEFGH. *An Earthen Farr.*

IKLMN. *A Cylindrical Piece to put between the
Farr and Recipient ONPQ.*

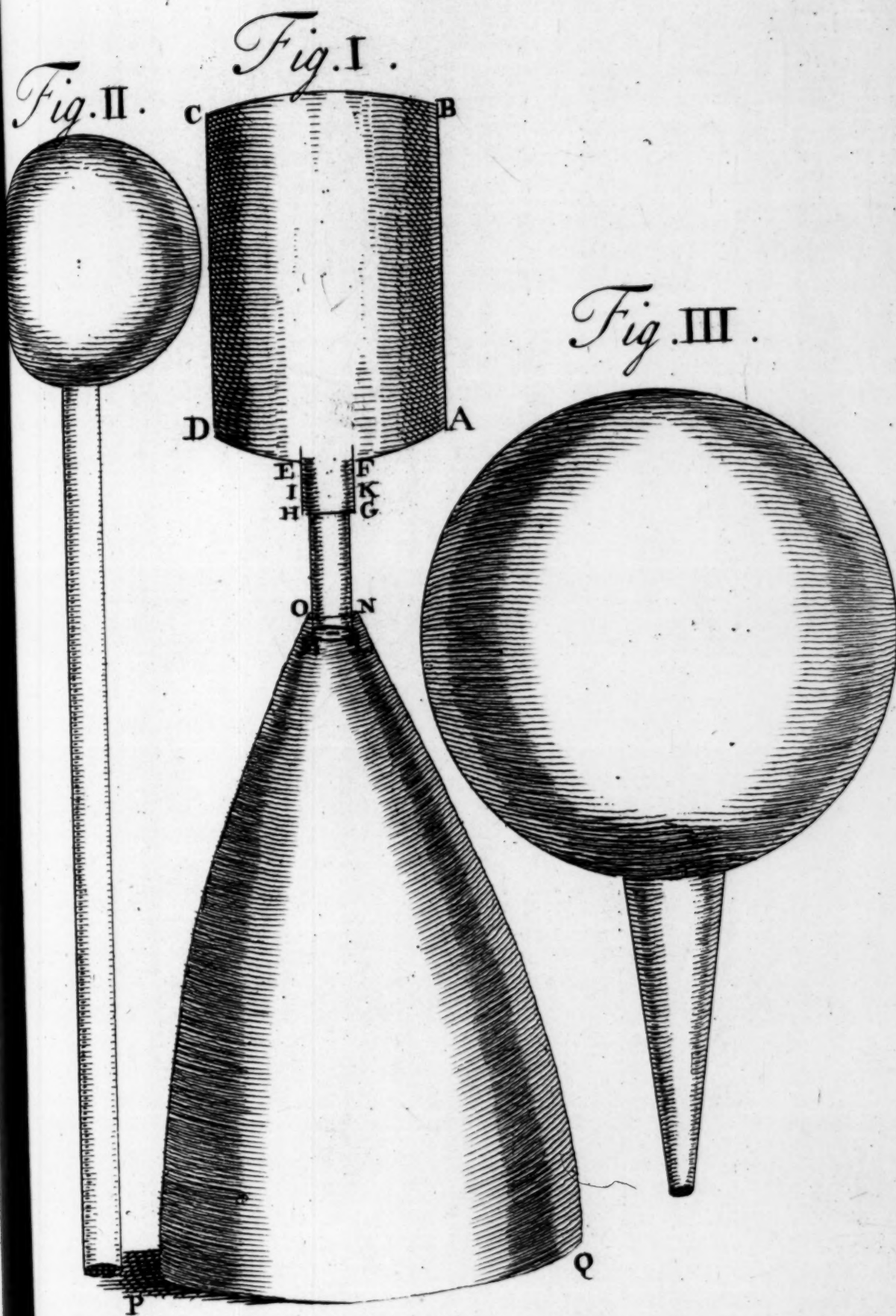
This shews the whole Apparatus for Distillation.

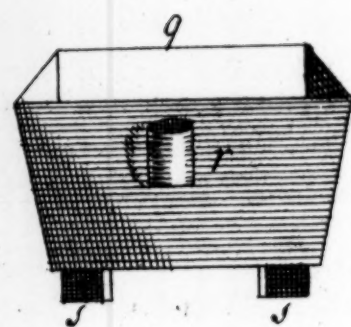
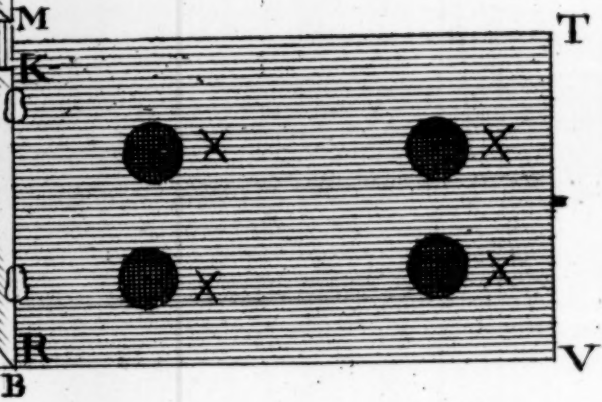
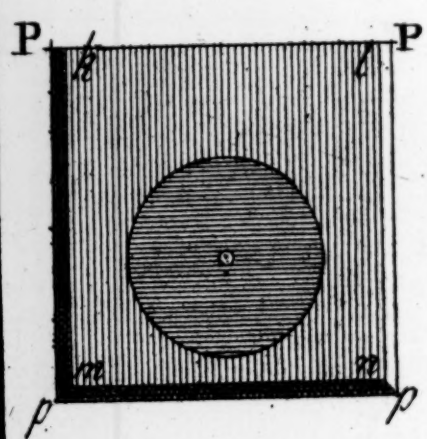
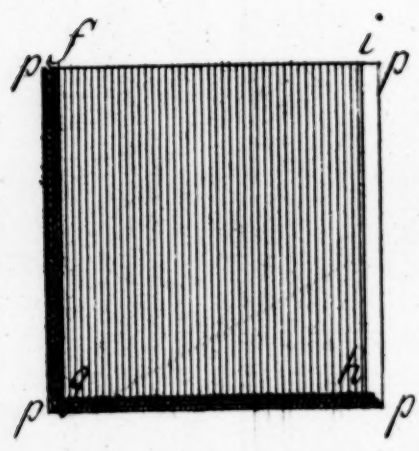
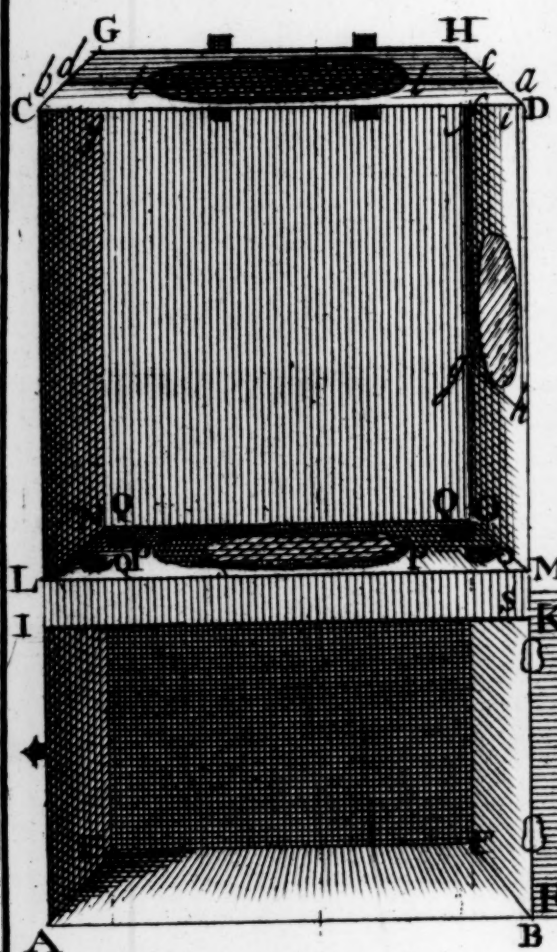
FIG. 2.

A Matraass.

FIG. 3.

A great Recipient.





P L A T E XIII.

The Figure of the first Furnace.

AB. *A nine Inch Bottom.*

ABEF. *The square Bottom.*

ACBD. *Height and Breadth.*

AI. BK. *Its Height 5 Inches.*

IL. KM. *The thickness of the Septum 1 Inch.*

LC. MD. *Its upper part's Altitude.*

PP. *A round hole for the Cucurbit.*

fghi. *A square hole, for putting in a square Plate.*

QQQC. *Four square holes for Chimneys.*

fp. gp. kp. ip. *A Magin cut out for a Cucurbite.*

klmn. *Another square Plate with a round hole
o for a Retort.*

fg. km. *Six Inches two 5ths.*

RSTU. *The Door to open or shut.*

XXXX. *Four round holes in the Door for Air.*

Z. *Wooden Stoppers.*

Cb. Da. Gd. Hc. *Two turning Valves.*

q. *An Earthen Vessel.*

r. *Its Handle.*

fs. *Its Feet.*

P L A T E XIV.

Second Furnace.

- AC. BD. *Iron Feet 12 Inches long.*
 CNOD. *Its Bottom 17 Inches over, of Iron or Brass.*
 CG. HD. *A hollow Cylinder 19 Inches high.*
 ELMF. *An Iron round Grate, supported by EF.*
 EL. MF. *Its Breadth 3 Inches and an half.*
 EC. DF. *The distance of the Grate from the Bottom 4 Inches.*
 NOQP. *The moveable Door of the Ash-hole.*
 QRPS. *The distance of the Door of the Fire-place from the Grate 3 Inches.*
 RSTU. *The Doors open 6 Inches, high 4 Inches and an half.*
 ILKM. *Elliptical Fire-place.*
 a. *A Stopper of the Door.*
 Z. *The same in another view.*
 KHX. *An open for the Retort.*
 IKX. *A Pot 10 Inches broad and 5 deep.*

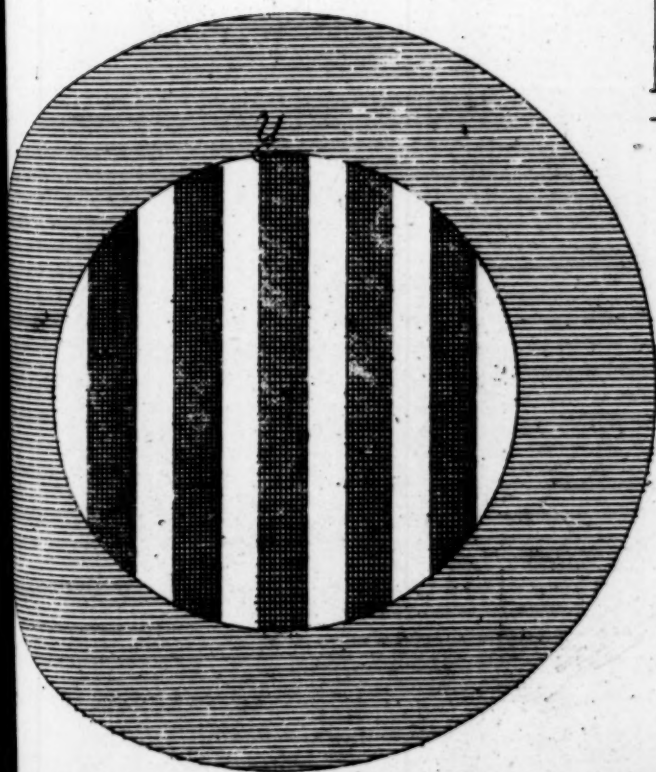
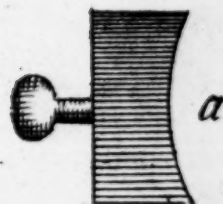
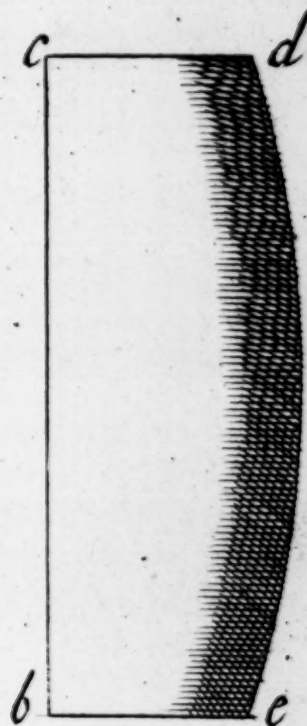
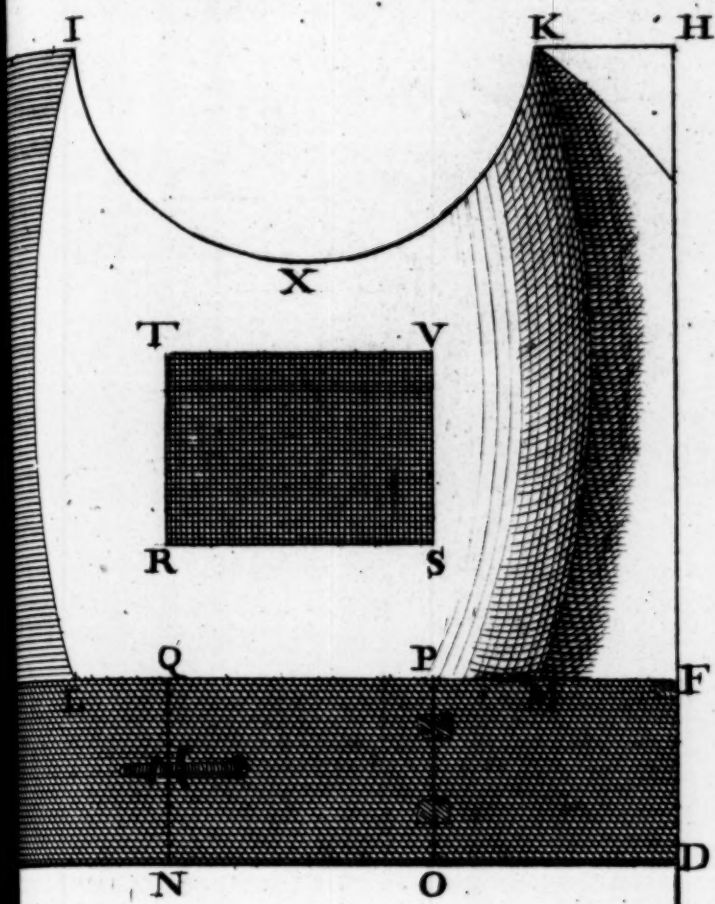


PLATE XV.

FIG. 1.

The Structure of a Furnace.

- AB. *Ash-hole 10 Inches broad.*
- AC. ——— 6 Inches high.
- EC. *Grate 1 Inch thick.*
- EI. *Height from the Grate 8 Inches.*
- IG. *The Vessel 12 Inches high.*
- LG. *The Margin 1 Inch.*
- GM. *The other Margin.*
- EGHF. *Cavity of the Furnace Elliptico-conoid, distance of Focus's 20 Inches, Normal in the Focus 5 Inches.*

FIG. 2.

A Vessel for distillation.

FIG. 3.

- A Brass Cover.*
- RS. *Handles to place it on.*
- RT. SV. *Its Middle.*
- TX. VY. *Its Neck.*

FIG. 4.

An Alembick.

FIG. 5.

A Vessel to distill with in Balneo Mariae.

FIG. 6.

A Tin Alembick.

PLATE

P L A T E XVI.

A Smelting Furnace.

abcd. *A Stone hollow Base.*

cdef. *Ash-hole.*

efih. *Grate.*

ab. cd. ef. hi. *Breadth 12 Inches.*

hk. il. *Fire-place 6 Inches high.*

kml. *A Paraboloid Cone, whose Axis is 8 Inches,
and Ordinate 6 Inches.*

mno. *A Cylindrical Chimney.*

ayqbxzs. *The thickness of the Stone 5 Inches.*

PLATE

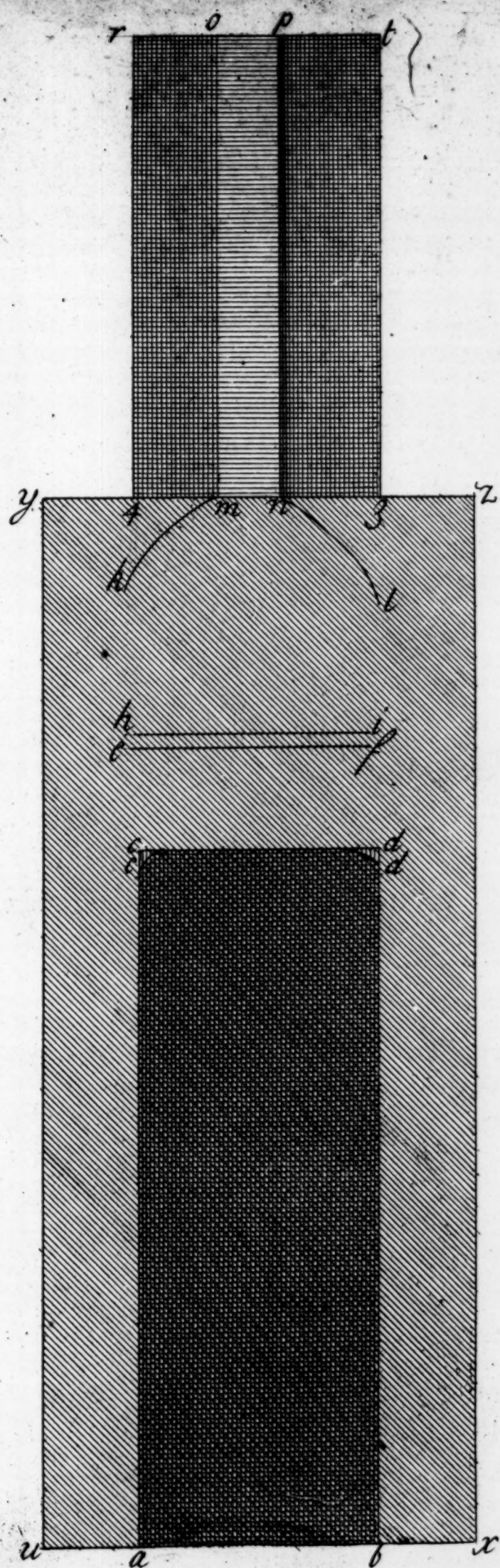


Fig. I.

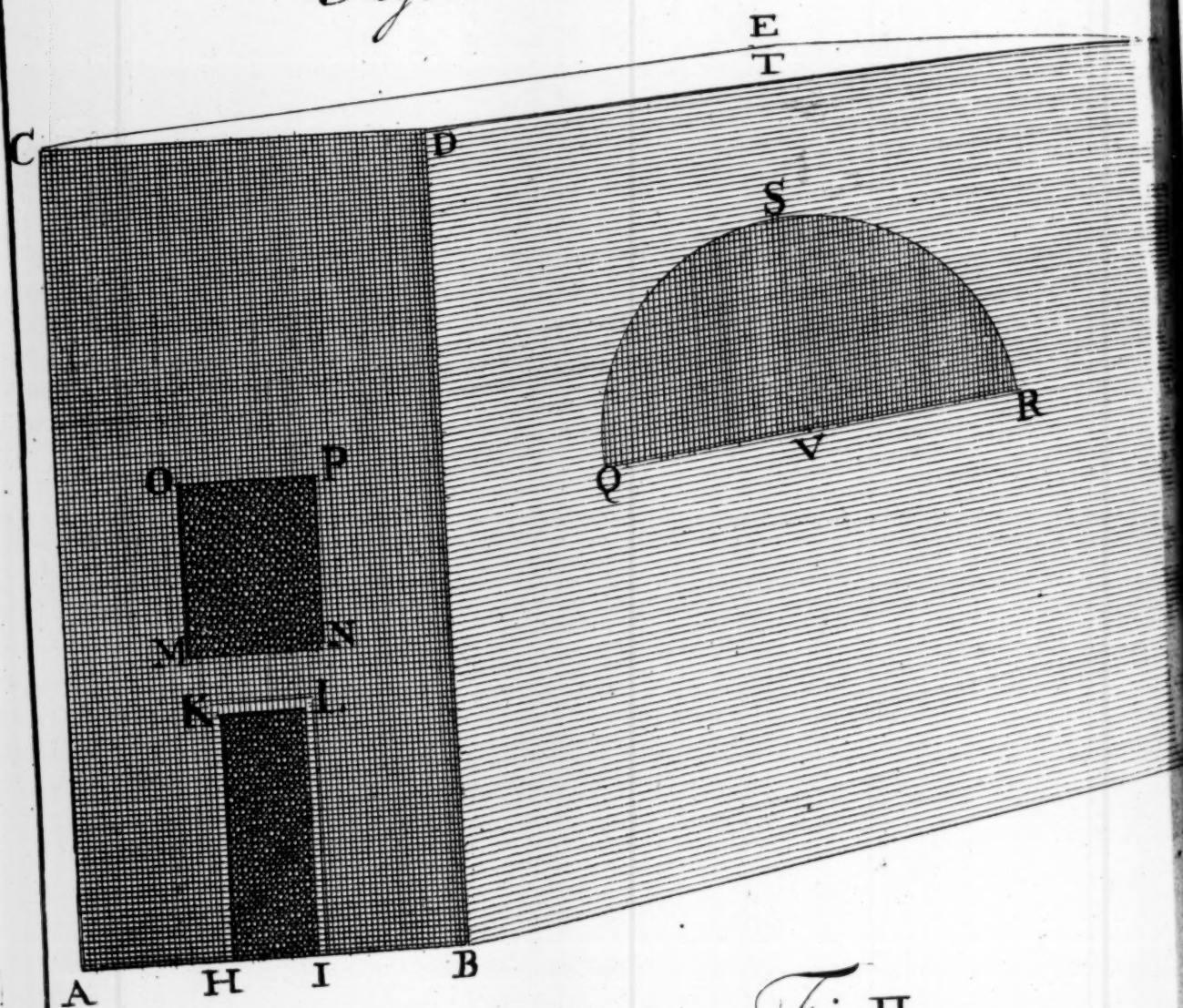
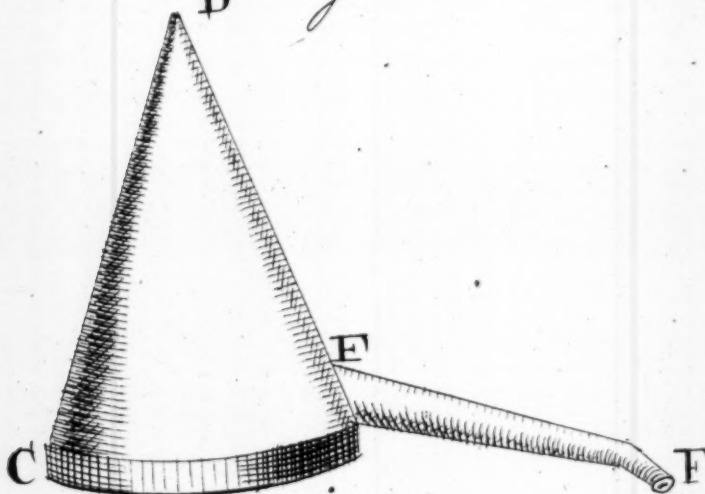
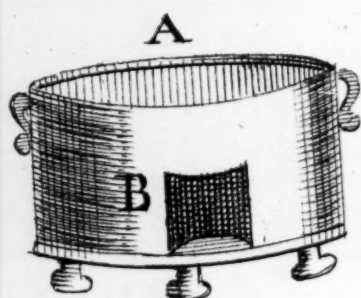


Fig. II.



P L A T E XVII.

Fifth Furnace.

FIG. 1.

AB. *The Furnace 20 Inches broad.*

AH. IB. *Length 8 Inches.*

III. *Ash-hole 11 Inches high.*

KM. LN. *Distance of the Door from the Ash-hole 3 Inches.*

MN. OP. — *Breadth 9 Inches.*

BG. DF. *Furnaces Length 38 Inches.*

QRS. *Place for the Vessels.*

QS. *Length 20 Inches. VS. Height 12 Inches.*

SF. *Thickness of the Wall 6 Inches.*

FIG. 2.

AB. *A Furnace of Brass for the first Process,*
Tom. II.

CDEF. *A Tin Alembick to fit AB.*

PLATE XVII

ERRATA.

T. 1. p. 179. for קל, read קלי. T. 2. p. 110. l. 7. for
drugs, read dregs. Process 214. p. 192. after *tis emetic*, read
it is call'd golden, because if rubb'd on Silver, it gilds it.

